TAMIL NADU PUBLIC SERVICE COMMISSION

Advertisement No.712

Notification No.10 / 2025 **Date: 13.06.2025**

Combined Technical Services Examination (Diploma / ITI Level)

Applications are invited only through online mode for direct recruitment to the posts in Combined Technical Services Examination (Diploma / ITI Level).

1. Important Instructions:

1.1. Candidates to ensure their eligibility for the examination:

All candidates are requested to carefully read the "Instructions to Applicants" available in the Commission's website www.tnpsc.gov.in and this Notification. The candidates applying for the examination should ensure that they fulfill all eligibility conditions for admission to the examination. Their admission to all stages of the examination will be purely provisional, subject to their satisfying the eligibility conditions. Mere admission to the written examination, certificate verification, counselling or inclusion of name in the selection list will not confer on the candidates any right to appointment. The Commission reserves the right to reject candidature at any stage, after due process even after selection has been made, if a wrong claim or violation of rules or instructions is confirmed.

1.2. Important Dates and Time:

Date of Notification		13.06.2025
Last date and time for submission of online application		12.07.2025 11:59 PM
Application Correction Window period		16.07.2025 12:01 AM to 18.07.2025 11:59 PM
Date and Time of Examination		
Paper - I		
Subject	**Subject Code**	**Date**
Tamil Eligibility Test, General Studies and Aptitude and Mental Ability	501	31.08.2025 F.N.
Paper - II		
Subject Paper	**Subject Code**	**Date**
Agriculture	431	07.09.2025 and 11.09.2025 to 15.09.2025
Chemical Engineering and Technology	452	
Civil Engineering	443	
Civil and Mining Engineering	574	
Electrical and Electronics Engineering	446	
Handloom Technology, Textile Technology and Textile Manufacture	445	
Horticulture	432	

Mechanical Engineering	441	
Mining Engineering	346	
Physical Education	354	
Rubber and Polymer Technology	576	
Trade: Advanced Computer Numerical Control Machining Technician	534	
Trade: Architectural Draughtsman	531	
Trade: Basic Designer and Virtual Verifier	532	
Trade: Computer Hardware and Network Maintenance	533	
Trade: Diesel Mechanic	521	
Trade: Draughtsman Civil	388	
Trade: Electrician	438	
Trade: Electronics Mechanic	535	
Trade: Engineering Drawing and Draughtsman (Mechanical and Civil)	551	
Trade: Fashion Design and Technology	570	
Trade: Fitter	436	
Trade: Food Production (General)	536	
Trade: In-Plant Logistics Assistant	569	
Trade: Industrial Robotics and Digital Manufacturing Technician	538	
Trade: Information and Communication Technology System Maintenance	537	
Trade: Machinist	539	07.09.2025 and 11.09.2025 to 15.09.2025
Trade: Manufacturing Process Control and Automation	543	
Trade: Mechanic Auto Body Repair	541	
Trade: Mechanic Electric Vehicle	542	
Trade: Mechanic Motor Vehicle	437	
Trade: Mechanic Two and Three Wheeler	553	
Trade: Mechanic Refrigeration and Air Conditioner Technician	435	
Trade: Operator Advanced Machine Tools	544	
Trade: Pump Operator cum Mechanic	545	
Trade: Sewing Technology	546	
Trade: Sheet Metal	520	
Trade: Smartphone Technician cum App Tester	547	
Trade: Solar Technician (Electrical)	548	
Trade: Surveyor	387	
Trade: Technician Medical Electronics	549	
Trade: Textile Mechatronics	568	
Trade: Turner, Tool and Die Maker	552	
Trade: Welder (Gas and Electric)	440	
Trade: Wireman	550	
Trade: Workshop Calculation Science	540	

1.2.1. The paper wise date and time for the examination will be informed only through Commission's website www.tnpsc.gov.in.

1.3. How to Apply:

1.3.1. One Time Registration and Online Application:

Candidates are required to apply online by using the Commission's website www.tnpscexams.in. The candidate needs to register himself / herself first at the One Time Registration (OTR) platform, available on the Commission's website, and then proceed to fill up the online application for the examination. If the candidate is already registered, he / she can proceed straightway to fill up the online application for the examination.

1.3.2. Application Correction Window:

After the last date for submission of online application, the Application Correction Window will open for 3 days from 16.07.2025 to 18.07.2025. During this period, candidates will be able to edit the details in their online application. After the last date of the Application Correction Window period, no modification is allowed in the online application.

1.3.3. Subject Paper Options:

Candidates should choose the subject paper(s) and specify in the online application. The candidates should only choose the subject paper(s) in which they have obtained the educational qualification or equivalent qualification for appearing in the examination.

1.3.4. The detailed instructions regarding how to apply and the examination centers are available in Annexure I of this Notification.

1.3.5. Any claim by the candidate after the submission of an online application will not be entertained.

1.4. Banned Items:

1.4.1. Candidates are not allowed to bring mobile phone, pager or any electronic equipment or programmable device or storage media like pen drive, smart watches, watches with in-built memory notes, rings with in-built memory notes, etc., or camera or Bluetooth devices or communication chips or any other equipment or related accessories either in working or switched off mode capable of being used as a communication device into the examination hall / room. Candidates are not allowed to bring non-electronic devices such as P&G Design Data Book, mathematical and drawing instruments, log tables, stencils of maps, slide rules, books, notes, loose sheets, guides, rough sheets, hand bags into the examination hall / room.

1.4.2. If they are found to have any such things or instruments, they will not be allowed to write the examination, besides invalidation of the answer sheet and / or debarment and / or rejection of candidature. If it is considered necessary, they will be subjected to a thorough physical search including frisking on the spot.

1.4.3. Candidates are advised, in their own interest, not to bring any of the banned items including mobile phones to the venue of the examination, as arrangements for safekeeping of the same cannot be assured.

2. Warning:

2.1. All the recruitments by the Tamil Nadu Public Service Commission are purely merit-based. The Tamil Nadu Public Service Commission hereby cautions the candidates against touts and agents who may cheat, by making false promises of securing jobs through unfair means. The Tamil Nadu Public Service

Commission shall not be responsible or liable for any loss that may be caused to any candidate on account of indulging in any sort of dealings with such unscrupulous elements.

2.2. Candidates are solely responsible for their claims in the online application. They cannot blame service providers like internet cafes / browsing centers / common service centers for the mistakes made while applying online for recruitment. Candidates are advised to check the filled–in online application before finally submitting the same.

3. Posts and Vacancies:

S. No.	Name of the Post	Post Code	Name of the Department / Organization	Number of Vacancies	Level of Pay
1.	Chemist, Grade-I (Institute of Ceramic Technology, Viruthachalam)	3679	Industries and Commerce	1	Level 20 (CPS)
2.	Mines Surveyor	3674	Tamil Nadu Minerals Limited	2	Level 15 (EPF)
3.	Assistant Manager (Mines)	3654	Tamil Nadu Magnesite Limited	2	Level 13 (EPF)
4.	Junior Engineer	3662	Archaeology	6	Level 13 (CPS)
5.	Junior Technical Assistant	1853	Textiles	3	Level 11 (CPS)
6.	Overseer / Junior Draughting Officer				
	Chengalpattu	3554	Rural Development and Panchayat Raj	1	
	Cuddalore	3557		2	
	Kallakurichi	3561		5	
	Thirupathur	3586		1	
	Tiruvannamalai	3581		4	
	Dharmapuri	3558		4	
	Krishnagiri	3565		1	
	Coimbatore	3556		1	
	Nagapattinam	3568		1	
	Tiruchirapalli	3584		1	
	Perambalur	3570		1	
	Ramanathapuram	3572		1	
	Sivagangai	3575		4	
7.	Junior Draughting Officer	3115	Highways	41*	
8.	Hostel Superintendent cum Physical Training Officer	1731	Employment and Training (Training Wing)	2	
9.	Junior Draughting Officer	3547	Tamil Nadu Forest Plantation Corporation Limited	1	Level 11 (EPF)
10.	Assistant Rubber Maker	3258	Arasu Rubber Corporation Limited	1	
11.	Surveyor	3378	Tamil Nadu Housing Board	10	Level 11 (CPS)
12.	Junior Training Officer (Architectural Draughtsman)	3615	Employment and Training (Training Wing)	1	
13.	Junior Training Officer (Basic Designer and Virtual Verifier)	3617		26	
14.	Junior Training Officer (Computer Hardware and Network Maintenance)	3618		2	
15.	Junior Training Officer (Advanced Computer Numerical Control Machining Technician)	3619		86*	

16.	Junior Training Officer (Draughtsman Civil)	3620	Employment and Training (Training Wing)	2	Level 11 (CPS)
17.	Junior Training Officer (Engineering Drawing)	3621		46*	
18.	Junior Training Officer (Electronics Mechanic)	3622		5	
19.	Junior Training Officer (Electrician)	3623		10	
20.	Junior Training Officer (Fashion Design and Technology)	3624		2	
21.	Junior Training Officer (Fitter)	3625		29	
22.	Junior Training Officer (Food Production)	3626		1	
23.	Junior Training Officer (Information and Communication Technology System Maintenance)	3627		2	
24.	Junior Training Officer (In-Plant Logistics Assistant)	3628		1	
25.	Junior Training Officer (Industrial Robotics and Digital Manufacturing Technician)	3629		84*	
26.	Junior Training Officer (Machinist)	3630		3	
27.	Junior Training Officer (Workshop Calculation and Science)	3631		41*	
28.	Junior Training Officer (Mechanic Auto Body Repair)	3632		2	
29.	Junior Training Officer (Mechanic Two and Three Wheeler)	3633		1	
30.	Junior Training Officer (Mechanic Electric Vehicle)	3634		63*	
31.	Junior Training Officer (Mechanic Motor Vehicle)	3635		1	
32.	Junior Training Officer (Manufacturing Process control and Automation)	3636		49*	
33.	Junior Training Officer (Refrigeration and Air Conditioner Technician)	3637		8	
34.	Junior Training Officer (Operator Advanced Machine Tool)	3638		3	
35.	Junior Training Officer (Pump Operator cum Mechanic)	3639		2	
36.	Junior Training Officer (Sewing Technology)	3640		4	
37.	Junior Training Officer (Smartphone Technician cum App Tester)	3641		2	
38.	Junior Training Officer (Solar Technician (Electrical))	3642		2	
39.	Junior Training Officer (Surveyor)	3643		5	
40.	Junior Training Officer (Technician Medical Electronics)	3644		2	
41.	Junior Training Officer (Textile Mechatronics)	3645		1	

42.	Junior Training Officer (Turner)	3646	Employment and Training (Training Wing)	5	Level 11 (CPS)
43.	Junior Training Officer (Welder)	3647		4	
44.	Junior Training Officer (Wireman)	3648		7	
45.	Assistant Agricultural Officer	3101	Agriculture	26	Level 10 (CPS)
46.	Assistant Horticultural Officer	3104	Horticulture	50# @	
47.	Technical Assistant (Civil)	3549	Tamil Nadu Housing Board	35*	
48.	Technical Assistant (Electrical)	3550		4	
49.	Junior Burner	3651	Tamil Nadu Magnesite Limited	2	Level 8 (EPF)
50.	Junior Foreman (Factory)	3652		2	
51.	Junior Tradesman (Mechanic Motor Vehicle)		Tamil Nadu State Transport Corporation		Level 1 (Rs.18,000-56,900) ## (CPS)
	MTC	3655		40$	
	TNSTC - Kumbakonam	3689		18$	
	TNSTC - Coimbatore	3690		55$	
	TNSTC - Tirunelveli	3691		25$	
	TNSTC - Salem	3692		11@	
	TNSTC - Madurai	3693		29$	
	SETC	3694		43@	
52.	Junior Tradesman (Electrician)				
	MTC	3659		20$	
	TNSTC - Kumbakonam	3683		40$	
	TNSTC - Coimbatore	3684		49$	
	TNSTC - Tirunelveli	3685		25$	
	TNSTC - Salem	3686		35@	
	TNSTC - Madurai	3687		4 $	
	SETC	3688		21@	
53.	Junior Tradesman (Welder)				
	MTC	3658		30$	
	TNSTC - Kumbakonam	3695		12$	
	TNSTC – Salem	3696		18@	
	TNSTC – Madurai	3697		04$	
54.	Junior Tradesman (Fitter)				
	TNSTC - Kumbakonam	3657		03$	
	TNSTC - Tirunelveli	3699		20$	
	TNSTC - Salem	3700		04@	
55.	Junior Tradesman Diesel Mechanic (TNSTC – Kumbakonam)	3656		18$	
56.	Junior Tradesman AC Mechanic (TNSTC – Salem)	3661		03	
57.	Junior Tradesman Sheet metal (TNSTC - Kumbakonam)	3660		10$	
58.	Technical Assistant (Electrical)	3591	Tamil Nadu Power Distribution Corporation Limited	656* @	Level 5 (Rs.21100-67100) (CPS)
			Total	**1910**	

* - Vacancies for reservation for outstanding sportspersons, are deducted
\# - Including Backlog Vacancies
@ - Including Shortfall Vacancies for Scheduled Castes / Scheduled Tribes
$ - Only Shortfall Vacancies for Scheduled Castes / Scheduled Tribes
- Daily paid Rs.872/- per day. After completion of 240 days of actual work in a continuos period, he / she will be posted as Junior Tradesman in regular pay scale

Abbreviations:
CPS – Contributory Pension Scheme
EPF – Employees' Provident Fund

3.1. The number of vacancies notified is tentative and is liable for modification, before the start of the Physical Certificate Verification / Counselling.

3.2. The Commission reserves the right to include additional posts with different nomenclature and having similar eligibility conditions, as announced in this notification.

3.3. The post wise distribution of vacancies is available in the Annexure VII of this Notification.

4. Eligibility Conditions:

4.1. Age Limit: (as on 01.07.2025)

The candidates should have completed the age of 18 years for all the posts (except Junior Training Officer posts in Employment and Training (Training Wing)). The candidates should have completed 21 years of age as on 01.08.2025 for the post of Junior Training Officer (Post Code: 3615, 3617 to 3648). The category wise maximum age limit and age concession details are given below:

4.1.1. Others (Candidates not belonging to SCs, SC(A)s, STs, MBCs/DCs, BC(OBCM)s and BCMs):

<table>
<tr><th rowspan="2">S. No.</th><th rowspan="2">Name of the Post</th><th rowspan="2">Post Code</th><th rowspan="2">Maximum Age (Should not have completed)</th><th colspan="3">Age Concession</th></tr>
<tr><th>Persons with Benchmark Disability</th><th>Ex-Servicemen</th><th>Destitute Widow</th></tr>
<tr><td>1.</td><td>Chemist, Grade-I</td><td>3679</td><td>47</td><td rowspan="3">NA</td><td rowspan="16">50</td><td rowspan="16">No Maximum Age Limit</td></tr>
<tr><td>2.</td><td>Mines Surveyor</td><td>3674</td><td rowspan="14">32</td></tr>
<tr><td>3.</td><td>Assistant Manager (Mines)</td><td>3654</td></tr>
<tr><td>4.</td><td>Junior Engineer</td><td>3662</td><td rowspan="13">42</td></tr>
<tr><td>5.</td><td>Junior Technical Assistant</td><td>1853</td></tr>
<tr><td>6.</td><td>Junior Draughting Officer</td><td>3115</td></tr>
<tr><td>7.</td><td>Junior Draughting Officer</td><td>3547</td></tr>
<tr><td>8.</td><td>Surveyor</td><td>3378</td></tr>
<tr><td>9.</td><td>Assistant Agricultural Officer</td><td>3101</td></tr>
<tr><td>10.</td><td>Assistant Horticultural Officer</td><td>3104</td></tr>
<tr><td>11.</td><td>Technical Assistant (Civil)</td><td>3549</td></tr>
<tr><td>12.</td><td>Technical Assistant (Electrical)</td><td>3550</td></tr>
<tr><td>13.</td><td>Junior Burner</td><td>3651</td></tr>
<tr><td>14.</td><td>Junior Foreman (Factory)</td><td>3652</td></tr>
<tr><td>15.</td><td>Assistant Rubber Maker</td><td>3258</td></tr>
<tr><td>16.</td><td>Junior Training Officer (Architectural Draughtsman)</td><td>3615</td><td rowspan="7">37</td><td rowspan="7">47</td></tr>
<tr><td>17.</td><td>Junior Training Officer (Basic Designer & Virtual Verifier)</td><td>3617</td></tr>
<tr><td>18.</td><td>Junior Training Officer (Computer Hardware and Network Maintenance)</td><td>3618</td></tr>
<tr><td>19.</td><td>Junior Training Officer (Advanced Computer Numerical Control Machining Technician)</td><td>3619</td></tr>
<tr><td>20.</td><td>Junior Training Officer (Draughtsman Civil)</td><td>3620</td></tr>
<tr><td>21.</td><td>Junior Training Officer (Engineering Drawing)</td><td>3621</td></tr>
<tr><td>22.</td><td>Junior Training Officer (Electronics Mechanic)</td><td>3622</td></tr>
</table>

23.	Junior Training Officer (Electrician)	3623	37	47	50	No Maximum Age Limit
24.	Junior Training Officer (Fashion Design and Technology)	3624				
25.	Junior Training Officer (Fitter)	3625				
26.	Junior Training Officer (Food Production)	3626				
27.	Junior Training Officer (Information and Communication Technology System Maintenance)	3627				
28.	Junior Training Officer (In Plant Logistics Assistant)	3628				
29.	Junior Training Officer (Industrial Robotics and Digital Manufacturing Technician)	3629				
30.	Junior Training Officer (Machinist)	3630				
31.	Junior Training Officer (Workshop Calculation and Science)	3631				
32.	Junior Training Officer (Mechanic Auto Body Repair)	3632				
33.	Junior Training Officer (Mechanic Two and Three Wheeler)	3633				
34.	Junior Training Officer (Mechanic Electric Vehicle)	3634				
35.	Junior Training Officer (Mechanic Motor Vehicle)	3635				
36.	Junior Training Officer (Manufacturing Process control and Automation)	3636				
37.	Junior Training Officer (Refrigeration and Air Conditioner Technician)	3637				
38.	Junior Training Officer (Operator Advanced Machine Tool)	3638				
39.	Junior Training Officer (Pump Operator cum Mechanic)	3639				
40.	Junior Training Officer (Sewing Technology)	3640				
41.	Junior Training Officer (Smartphone Technician cum App Tester)	3641				
42.	Junior Training Officer (Solar Technician (Electrical))	3642				
43.	Junior Training Officer (Surveyor)	3643				
44.	Junior Training Officer (Technician Medical Electronics)	3644				
45.	Junior Training Officer (Textile Mechatronics)	3645				
46.	Junior Training Officer (Turner)	3646				
47.	Junior Training Officer (Welder)	3647				

48.	Junior Training Officer (Wireman)	3648	37	47	50	No Maximum Age Limit
49.	Hostel Superintendent cum Physical Training Officer	1731				
50.	Overseer / Junior Draughting Officer	Refer table in para no.3				
51.	Junior Tradesman (Mechanic Motor Vehicle)		30	40	48	30
52.	Junior Tradesman (Electrician)					
53.	Junior Tradesman (Welder)					
54.	Junior Tradesman (Fitter)					
55.	Junior Tradesman (Diesel Mechanic)	3656				
56.	Junior Tradesman (AC Mechanic)	3661				
57.	Junior Tradesman (Sheet Metal)	3660				
58.	Technical Assistant (Electrical)	3591	32 *	42 *	50 *	No Maximum Age Limit
* - As per Hon'ble High Court Order in W.A.No.298 of 2016 and batch cases dated 19.11.2021, no maximum age limit for candidates covered under the Court orders and the similarly placed candidates only as a special case. NA - Not Applicable, since persons with benchmark disability are not eligible to apply for this post						

4.1.2. BC (OBCM)s, BCMs, MBCs/DCs, SCs, SC(A)s and STs:

S. No.	Name of the Post	Post Code	Maximum Age (Should not have completed)	Age Concession		
				Persons with Benchmark Disability	Ex-Service men	Destitute Widow
1.	Chemist, Grade-I	3679	No Maximum Age Limit	NA	No Maximum Age Limit	No Maximum Age Limit
2.	Mines Surveyor	3674				
3.	Assistant Manager (Mines)	3654				
4.	Junior Engineer	3662		No Maximum Age Limit		
5.	Junior Technical Assistant	1853				
6.	Junior Draughting Officer	3115				
7.	Hostel Superintendent cum Physical Training Officer	1731				
8.	Surveyor	3378				
9.	Assistant Rubber Maker	3258				
10.	Junior Training Officer (Architectural Draughtsman)	3615				
11.	Junior Training Officer (Basic Designer & Virtual Verifier)	3617				
12.	Junior Training Officer (Computer Hardware and Network Maintenance)	3618				
13.	Junior Training Officer (Advanced Computer Numerical Control Machining Technician)	3619				
14.	Junior Training Officer (Draughtsman Civil)	3620				
15.	Junior Training Officer (Engineering Drawing)	3621				
16.	Junior Training Officer (Electronics Mechanic)	3622				

17.	Junior Training Officer (Electrician)	3623	No Maximum Age Limit	No Maximum Age Limit	No Maximum Age Limit	No Maximum Age Limit
18.	Junior Training Officer (Fashion Design and Technology)	3624				
19.	Junior Training Officer (Fitter)	3625				
20.	Junior Training Officer (Food Production)	3626				
21.	Junior Training Officer (Information and Communication Technology System Maintenance)	3627				
22.	Junior Training Officer (In Plant Logistics Assistant)	3628				
23.	Junior Training Officer (Industrial Robotics and Digital Manufacturing Technician)	3629				
24.	Junior Training Officer (Machinist)	3630				
25.	Junior Training Officer (Workshop Calculation and Science)	3631				
26.	Junior Training Officer (Mechanic Auto Body Repair)	3632				
27.	Junior Training Officer (Mechanic Two and Three Wheeler)	3633				
28.	Junior Training Officer (Mechanic Electric Vehicle)	3634				
29.	Junior Training Officer (Mechanic Motor Vehicle)	3635				
30.	Junior Training Officer (Manufacturing Process control and Automation)	3636				
31.	Junior Training Officer (Refrigeration and Air Conditioner Technician)	3637				
32.	Junior Training Officer (Operator Advanced Machine Tool)	3638				
33.	Junior Training Officer (Pump Operator cum Mechanic)	3639				
34.	Junior Training Officer (Sewing Technology)	3640				
35.	Junior Training Officer (Smartphone Technician cum App Tester)	3641				
36.	Junior Training Officer (Solar Technician (Electrical))	3642				
37.	Junior Training Officer (Surveyor)	3643				
38.	Junior Training Officer (Technician Medical Electronics)	3644				
39.	Junior Training Officer (Textile Mechatronics)	3645				
40.	Junior Training Officer (Turner)	3646				
41.	Junior Training Officer (Welder)	3647				
42.	Junior Training Officer (Wireman)	3648				
43.	Assistant Agricultural Officer	3101				
44.	Assistant Horticultural Officer	3104				
45.	Technical Assistant (Civil)	3549				
46.	Technical Assistant (Electrical)	3550				

47.	Junior Burner	3651	No Maximum Age Limit	No Maximum Age Limit	No Maximum Age Limit	No Maximum Age Limit
48.	Junior Foreman (Factory)	3652				
49.	Junior Draughting Officer	3547				
50.	Technical Assistant (Electrical)	3591				
51.	Overseer / Junior Draughting Officer	Refer table in para no.3				
52.	Junior Tradesman (Mechanic Motor Vehicle)		BC / MBC / DNC / BCM - 35 SC / ST / SCA - 40	BC / MBC / DNC / BCM - 45 SC / ST / SCA - 50	53	BC / MBC / DNC / BCM - 35 SC / ST / SCA - 40
53.	Junior Tradesman (Electrician)					
54.	Junior Tradesman (Welder)					
55.	Junior Tradesman (Fitter)					
56.	Junior Tradesman (Diesel Mechanic)	3656				
57.	Junior Tradesman (AC Mechanic)	3661				
58.	Junior Tradesman (Sheet Metal)	3660				

Abbreviations:

BC (OBCM)s - Backward Classes (Other than Backward Class Muslims)
BCMs - Backward Class Muslims
MBCs/DCs - Most Backward Classes / Denotified Communities
SCs - Scheduled Castes
SC(A)s - Scheduled Castes (Arunthathiyars)
STs - Scheduled Tribes
NA - Not Applicable, since persons with benchmark disability are not eligible to apply for this post.

4.1.3. The above mentioned age concession will not apply to the Ex-Servicemen candidates who have already been recruited to any class or service or category, as per section 3 (j) (vii) of Tamil Nadu Government Servants (Conditions of Service) Act, 2016.

4.1.4. No maximum age limit shall mean that the candidates should not have completed 60 years of age as on 1.7.2025 or at the time of selection / appointment to the post.

4.1.5. Supporting Documents:

4.1.5.1. The date of birth will be verified against the tenth standard (SSLC) or twelfth standard (HSC) mark sheet, issued by the Tamil Nadu Board of Secondary Education and Tamil Nadu Board of Higher Secondary Education respectively. Those candidates whose date of birth is not mentioned in their tenth standard / twelfth standard mark sheet must upload their Birth Certificate / Transfer Certificate / Degree mark sheets, instead of the tenth standard or twelfth standard mark sheet. Any other form of evidence will not be accepted. Failure to upload such a document shall result in the rejection of candidature after due process.

4.1.5.2. Candidates claiming age concession should upload the supporting documents for such a claim. Failure to upload such a document shall result in the rejection of candidature after due process.

4.2. Educational, Technical Qualification and Experience:

S. No.	Name of the Post	Post Code	Qualification and Experience
1.	Chemist, Grade-I	3679	i) A first or second class M.Sc., degree or B.Sc., (Hon) in Chemistry or in Chemical Technology or in Industrial Chemistry or a first or second class B.Sc., degree in Chemistry or in Chemical Technology or in Industrial Chemistry or a diploma in

			Chemical Technology or in Chemical Engineering issued by any recognized Institution or Board; and ii) Experience in research in pure or applied Chemistry or Analytical Chemistry for a period of not less than two years
2.	Mines Surveyor	3674	i) Degree in Civil / Mining or Diploma in Civil / Mining ii) Mines Surveyor's certificate of Competency
3.	Assistant Manager (Mines)	3654	i) Degree or Diploma in Mining Engineering ii) 2nd class Mines managers certificate of competency
4.	Junior Engineer	3662	Must possess Diploma in Civil Engineering awarded by the State Board of Technical Education
5.	Junior Technical Assistant	1853	i) Must possess Minimum General Educational Qualification ii) Must possess a Diploma in Handloom Technology obtained from the Indian Institute of Handloom Technology, Salem or Varanasi or from any other recognized Institute of Handloom Technology (or) Diploma in Textile Manufacture obtained from the Technological Diploma Examination Board, Madras or the State Board of Technical Education and Training, Tamil Nadu
6.	Overseer / Junior Draughting Officer	Refer table in para No.3	i) Must possess a Diploma in Civil Engineering ii) Other things being equal, preference shall be given to the persons possessing a Bachelor's Degree in Civil Engineering from any University or Institution recognized by the University Grants Commission
7.	Junior Draughting Officer	3115	i) A Diploma in Civil Engineering or its equivalent from any University or Institution awarded by the State Board of Technical Education and Training of the concerned State Government; ii) Other things being equal, preference shall be given, to those who have undergone one year apprenticeship training under the Government of India Scheme or the State Government Apprenticeship Scheme
8.	Hostel Superintendent cum Physical Training Officer	1731	i) Must possess a Diploma in Physical Education issued by any University or Institution (or) Must possess the Teachers Certificate in Physical Education (Higher Grade) and Teaching Experience for a period of not less than one year and ii) Must have been declared eligible for admission to the college course of study under the old 11 year schooling or Must have been declared eligible for admission to the Higher Secondary Course under the present 10 year schooling
9.	Junior Draughting Officer	3547	D.C.E. (Diploma in Civil Engineering)
10.	Surveyor	3378	i) A Diploma in Civil Engineering from any Institute approved by All India Council for Technical Education; (or) National Trade Certificate in the trade of Surveyor awarded by National Council for Vocational Training (for Surveyor); (or) A Certificate in Army Trade Surveyor (field) issued by Madras Engineering Group
11.	Assistant Rubber Maker	3258	i) Must be a B.Sc., degree holder in Chemistry with first class or Diploma in Rubber Technology or Polymer Technology

			ii) Other things being equal preference will be given to a Post Graduate in Chemistry
12.	Junior Training Officer (Architectural Draughtsman)	3615	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Architecture / Civil from any Institution / University recognized by All India Council for Technical Education / UGC; (or) (b) Diploma in Civil Engineering / Architectural Assistantship from any Institution / University recognized by All India Council for Technical Education / UGC; (or) (c) National Trade Certificate / National Apprenticeship Certificate in Architectural Draughtsman
13.	Junior Training Officer (Basic Designer and Virtual Verifier)	3617	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Industrial / Mechanical / Production / Mechanical Engineering Design and Drafting / Mechatronics from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Manufacturing Engineering / Industrial Engineering / Mechanical Engineering / Production Engineering / Mechanical Engineering Design and Drafting / Mechatronics Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Basic Designer and Virtual Verifier
14.	Junior Training Officer (Computer Hardware and Network Maintenance)	3618	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Computer Science / Electronics and Communication / Information Technology from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Computer Technology / Computer Science and Engineering / Computer Engineering / Electronics and Communication Engineering / Technology / Information Technology / Computer Networking from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Computer Hardware and Network Maintenance
15.	Junior Training Officer (Advanced Computer Numerical Control Machining Technician)	3619	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering/ Technology in Manufacturing / Industrial / Mechanical / Production / Mechatronics from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Manufacturing Engineering / Industrial Engineering / Mechanical Engineering / Production Engineering / Mechatronics Engineering from any Institution /

			University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Advanced Computer Numerical Control Machining Technician
16.	Junior Training Officer (Draughtsman Civil)	3620	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Civil from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Civil Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Draughtsman Civil
17.	Junior Training Officer (Engineering Drawing)	3621	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering from All India Council for Technical Education / UGC recognized Engineering College / University (or) (b) Diploma in Engineering from All India Council for Technical Education / recognized board of technical education or relevant Advanced Diploma (Vocational) from Directorate General of Training (or) (c) National Trade Certificate / National Apprenticeship Certificate in 'Any one of the Mechanical group (Grade I) trades categorised under Engineering Drawing' or 'Draughtsman Mechanical' or 'Draughtsman Civil' trades The list of Mechanical group (Grade I) trades is available in List I of Annexure VIII of this notification
18.	Junior Training Officer (Electronics Mechanic)	3622	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Electrical / Electrical and Electronics / Electronics and Communication from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Electrical / Electrical and Electronics / Electronics and Communication from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Electronics Mechanic
19.	Junior Training Officer (Electrician)	3623	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Electrical / Electrical and Electronics from any Institution / University recognized by All India Council for Technical Education / UGC (or)

			(b) Diploma in Electrical / Electrical and Electronics Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Electrician
20.	Junior Training Officer (Fashion Design and Technology)	3624	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Apparel Technology / Textile Technology from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Garment Technology / Apparel Technology / Costume Design and Dress Making / Fashion Design & Clothing Technology / Fashion Technology from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Fashion Design and Technology
21.	Junior Training Officer (Fitter)	3625	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in / Mechanical / Production / Manufacturing from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Mechanical / Production / Manufacturing Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Fitter
22.	Junior Training Officer (Food Production)	3626	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Hotel Management / Catering Technology / Hotel & Catering Management from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Hotel Management & Catering Technology from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Food Production
23.	Junior Training Officer (Information and Communication Technology System Maintenance)	3627	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Computer Science / Information Technology / Electronics and Communication from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Computer Science / Electronics and Communication / Computer Technology / Computer Science and Engineering / Computer Engineering / Information

			Technology from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Information and Communication Technology System Maintenance
24.	Junior Training Officer (In-Plant Logistics Assistant)	3628	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Mechanical / Production from All India Council for Technical Education / UGC recognized Engineering College / University (or) (b) Diploma in Mechanical / Production Engineering from All India Council for Technical Education / recognized board of Technical Education or relevant Advanced Diploma (Vocational) from Directorate General of Training (or) (c) National Trade Certificate / National Apprenticeship Certificate in In-Plant Logistics Assistant
25.	Junior Training Officer (Industrial Robotics and Digital Manufacturing Technician)	3629	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Manufacturing / Industrial / Mechanical / Production / Mechatronics / Robotics and Automation from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Electronics / Manufacturing Engineering / Industrial Engineering / Mechanical Engineering / Production Engineering / Mechatronics Engineering / Robotics and Automation from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Industrial Robotics and Digital Manufacturing Technician
26.	Junior Training Officer (Machinist)	3630	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Mechanical / Production / Manufacturing from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Mechanical / Production / Manufacturing Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Machinist
27.	Junior Training Officer (Workshop Calculation and Science)	3631	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering from All India Council for Technical Education / UGC recognized Engineering College / University (or) (b) Diploma in Engineering from All India Council for Technical Education / recognized board of Technical Education or

			relevant Advanced Diploma (Vocational) from Directorate General of Training (or) (c) National Trade Certificate / National Apprenticeship Certificate in any one of the engineering trades The list of engineering trades is available in List II of Annexure VIII of this notification
28.	Junior Training Officer (Mechanic Auto Body Repair)	3632	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Mechanical / Automobile from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Mechanical Engineering / Automobile Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Mechanic Auto Body Repair
29.	Junior Training Officer (Mechanic Two and Three Wheeler)	3633	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Automobile / Mechanical (with specialization in Automobile) / Mechanical from Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Automobile / Mechanical (specialization in automobile) / Mechanical Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Mechanic Two and Three Wheeler
30.	Junior Training Officer (Mechanic Electric Vehicle)	3634	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Mechanical / Automobile from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Mechanical Engineering / Automobile Engineering from any Institution/ University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Mechanic Electric Vehicle
31.	Junior Training Officer (Mechanic Motor Vehicle)	3635	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Mechanical / Automobile from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Mechanical Engineering / Automobile Engineering from any Institution / University recognized by All India Council for Technical Education / UGC

			(or) (c) National Trade Certificate / National Apprenticeship Certificate in Mechanic Motor Vehicle
32.	Junior Training Officer (Manufacturing Process control and Automation)	3636	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Manufacturing / Industrial / Mechanical / Production / Mechatronics from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Electronics / Manufacturing Engineering / Industrial Engineering / Mechanical Engineering / Production Engineering / Mechatronics Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Manufacturing Process control and Automation
33.	Junior Training Officer (Refrigeration and Air Conditioner Technician)	3637	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Mechanical / Production / Manufacturing from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Mechanical / Production / Manufacturing Engineering / Refrigeration & Air Conditioning from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Refrigeration and Air Conditioner Technician
34.	Junior Training Officer (Operator Advanced Machine Tool)	3638	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Manufacturing / Industrial / Mechanical / Production / Mechatronics from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Manufacturing Engineering / Industrial Engineering / Mechanical Engineering / Production Engineering / Mechatronics Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Operator Advanced Machine Tool
35.	Junior Training Officer (Pump Operator cum Mechanic)	3639	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Mechanical / Automobile from any Institution / University recognized by All India Council for Technical Education / UGC (or)

			(b) Diploma in Mechanical Engineering / Automobile Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Pump Operator cum Mechanic
36.	Junior Training Officer (Sewing Technology)	3640	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Fashion & Apparel Technology / Textile Technology from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Garment fabrication Technology / Costume Design & Dress Making / Garment Technology / Apparel Technology / Fashion Design & Clothing Technology / Fashion Technology from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Sewing Technology
37.	Junior Training Officer (Smartphone Technician cum App Tester)	3641	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Electronics / Electronics and Telecommunication / Electronics and Communication Engineering / Computer Networking from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Electronics / Electronics and Telecommunication / Electronics and Communication Engineering / Computer Networking from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Smartphone Technician cum App Tester
38.	Junior Training Officer (Solar Technician (Electrical))	3642	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Electrical / Electrical and Electronics from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Electrical / Electrical and Electronics Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Solar Technician (Electrical)
39.	Junior Training Officer (Surveyor)	3643	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Survey / Civil from any Institution / University recognized by All India Council for Technical Education / UGC (or)

			(b) Diploma in Survey Engineering / Civil Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Surveyor
40.	Junior Training Officer (Technician Medical Electronics)	3644	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Electronics / Bio Medical / Medical Electronics / Electronics and Communication from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Electronics / Bio Medical / Medical Electronics Engineering / Electronics and Communication Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Technician Medical Electronics
41.	Junior Training Officer (Textile Mechatronics)	3645	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Textile Mechatronics / Textile Technology / Textile Processing / Textile Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Textile Mechatronics / Textile Technology / Textile Processing / Textile Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Textile Mechatronics
42.	Junior Training Officer (Turner)	3646	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Mechanical / Production / Manufacturing from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Mechanical / Production / Manufacturing Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in the trade of 'Turner' or 'Tool and Die maker (PTJF)' or 'Tool and Die maker (Dies and Moulds)'
43.	Junior Training Officer (Welder)	3647	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering/Technology in Mechanical / Metallurgy / Mechatronics / Production / Manufacturing from any Institution / University recognized by All India Council for Technical Education / UGC (or)

			(b) Diploma in Mechanical and allied / Production / Manufacturing Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Welder
44.	Junior Training Officer (Wireman)	3648	i) Must have passed SSLC or its equivalent; and ii) Any one of the following (a) Degree in Engineering / Technology in Electrical / Electrical and Electronics from any Institution / University recognized by All India Council for Technical Education / UGC (or) (b) Diploma in Electrical / Electrical and Electronics Engineering from any Institution / University recognized by All India Council for Technical Education / UGC (or) (c) National Trade Certificate / National Apprenticeship Certificate in Wireman
45.	Assistant Agricultural Officer	3101	i) Must have passed Higher Secondary (plus two) Examination ii) Must possess two years Diploma in Agriculture from the Institution recognized by the Government of Tamil Nadu or affiliated with the Tamil Nadu Agricultural University; or Gandhigram Rural Institute, Dindigul District or Annamalai University or any other Institution under the control of the Commissioner of Agriculture
46.	Assistant Horticultural Officer	3104	i) A pass in Higher Secondary Examination and ii) A pass in two years Diploma course in Horticulture in the Institutions approved by Tamil Nadu Agricultural University / Gandhigram Rural University / Director of Horticulture and Plantation Crops or Diploma Course in Horticulture awarded by the Annamalai University
47.	Technical Assistant (Civil)	3549	A Diploma in Civil Engineering from any Institute approved by All India Council for Technical Education
48.	Technical Assistant (Electrical)	3550	A Diploma in Electrical Engineering from any Institute approved by All India Council for Technical Education
49.	Junior Burner	3651	B.Sc (Chemistry) or Diploma in Chemical Engineering
50.	Junior Foreman (Factory)	3652	Diploma in Mechanical Engineering
51.	Junior Tradesman (Mechanic Motor Vehicle)	Refer table in para No.3	i) Must have passed SSLC ii) Must have passed ITI certificate examination (NTC) in Mechanic Motor Vehicle (MMV) Trade iii) Must have completed the Apprenticeship under the Apprenticeship Act, 1961/1973 in any of the Organisation in Tamil Nadu and obtained National Apprenticeship Certificate
52.	Junior Tradesman (Electrician)		i) Must have passed SSLC ii) Must have passed ITI certificate examination (NTC) in Electrician Trade iii) Must have completed the Apprenticeship under the Apprenticeship Act, 1961/1973 in any of the Organisation in Tamil Nadu and obtained National Apprenticeship Certificate
53.	Junior Tradesman (Welder)		i) Must have passed SSLC ii) Must have passed ITI certificate examination (NTC) in Welder Trade iii) Must have completed the Apprenticeship under the Apprenticeship Act, 1961/1973 in any of the Organisation in

			Tamil Nadu and obtained National Apprenticeship Certificate
54.	Junior Tradesman (Fitter)		i) Must have passed SSLC ii) Must have passed ITI certificate examination (NTC) in Fitter Trade iii) Must have completed the Apprenticeship under the Apprenticeship Act, 1961/1973 in any of the Organisation in Tamil Nadu and obtained National Apprenticeship Certificate
55.	Junior Tradesman (Diesel Mechanic)	3656	i) Must have passed SSLC ii) Must have passed ITI certificate examination (NTC) in Diesel Mechanic Trade iii) Must have completed the Apprenticeship under the Apprenticeship Act, 1961/1973 in any of the Organisation in Tamil Nadu and obtained National Apprenticeship Certificate
56.	Junior Tradesman (AC Mechanic)	3661	i) Must have passed SSLC ii) Must have passed ITI certificate examination (NTC) in AC Mechanic Trade iii) Must have completed the Apprenticeship under the Apprenticeship Act, 1961/1973 in any of the Organisation in Tamil Nadu and obtained National Apprenticeship Certificate
57.	Junior Tradesman (Sheet Metal)	3660	i) Must have passed SSLC ii) Must have passed ITI certificate examination (NTC) in Sheet Metal Trade iii) Must have completed the Apprenticeship under the Apprenticeship Act, 1961/1973 in any of the Organisation in Tamil Nadu and obtained National Apprenticeship Certificate
58.	Technical Assistant (Electrical)	3591	Diploma in Electrical and Electronics Engineering or Equivalent

4.2.1. The candidates should possess the educational qualification, technical qualification and experience prescribed for the post, on the date of notification. The period of practical or other experience should have been acquired after obtaining the educational qualification prescribed for the post.

4.2.2. The Diploma / I.T.I / National Trade Certificate / National Apprenticeship Certificate / Under Graduate / Post Graduate degree qualification prescribed for the above posts should have been obtained by passing the required qualification in the following order of studies viz., SSLC + HSC / Diploma / I.T.I or its equivalent + Under Graduate Degree + Post Graduate Degree.

4.2.3. The posts for which prescribed qualification is Diploma in a particular subject, then a degree in the subject will be considered as a higher qualification. The candidates possessing degree in the subject are also eligible to apply, except for the posts of Assistant Agricultural Officer (Post Code: 3101) and Assistant Horticultural Officer (Post Code: 3104).

4.2.4. Candidates not possessing the two years Diploma in Agriculture are not eligible for the post of Assistant Agricultural Officer (Post Code: 3101) and candidates not possessing the two years Diploma in Horticulture are not eligible for the post of Assitant Horticultural Officer (Post Code: 3104) even though they possess higher qualification. Diploma in Agricultural Technology (3 Years course) is not the prescribed educational qualification, for the post of Assistant Agricultural Officer (Post Code: 3101).

4.2.5. Candidates who have not possessed Industrial Training Institute Certificate in the Trades of Mechanic Motor Vehicle, Electrician, Welder, Fitter, Diesel Mechanic, AC Mechanic and Sheet Metal

are not eligible for the post of Junior Tradesman (refer para No.3) in Tamil Nadu State Transport Corporation in various Divisions even though they possess higher qualification.

4.2.6. Supporting Documents:

4.2.6.1. SSLC / HSC / I.T.I Certificate / National Trade Certificate / National Apprenticeship Certificate / Diploma / Degree / PG Degree / Integrated PG Degree / Provisional Degree or Provisional Diploma Certificate / Consolidated Mark Sheet along with Degree or Provisional Degree Certificate shall be accepted as proof of educational qualification.

4.2.6.2. In cases where the I.T.I Certificate / National Trade Certificate / National Apprenticeship Certificate / Diploma / Degree / PG Degree certificates had been issued after the date of notification, candidates must upload proof of the publication of results of the respective qualification(s) on or before the date of notification in the form of Provisional Diploma / I.T.I / Degree Certificate / Consolidated Mark Sheet / Certificate from the Head of the Institution / University in the format prescribed in Annexure VI.

4.2.6.3. Candidates claiming possession of qualification higher than that prescribed for a post, must upload certificates, issued on / before the date of notification, in support of such claim.

4.2.6.4. Candidates claiming experience for the posts of Chemist, Grade I (Post Code: 3679) and Hostel Superintendent cum Physical Training Officer (Post Code: 1731) should upload the experience certificate in the format available in Annexure V of this notification.

4.2.6.5. In cases where the duration of the prescribed educational / technical course / experience has been specified in the notification, any discrepancy between the claim in the application and the documents uploaded shall result in the rejection of candidature after due process.

4.2.6.6. In case the Degree Certificate is lost or is not immediately available for reasons to be specified, an extract from the Convocation Register will be accepted as evidence of qualification.

4.2.6.7. The candidates claiming equivalence of qualification should upload a copy of the Government order at the time of uploading of documents, failing which his / her candidature will be rejected after due process. The Government orders relating to equivalence of qualification are available on the website of the Tamil Nadu State Council for Higher Education (www.tnsche.tn.gov.in). The Government orders regarding equivalence of qualification issued after the date of physical certificate verification will not be considered for this recruitment.

4.3. Medical and Physical Standards:

4.3.1. Candidates selected for appointment to the posts will be required to submit a certificate of physical fitness to the Appointing Authority at the time of joining the post.

4.3.2. The prescribed standards of visual acuity of the candidates selected for the following posts are mentioned below;

S. No.	Name of the Post	Post Code	Standard of Vision
1.	Chemist, Grade-I	3679	Standard III or better, Colour blindness or night blindness to be a disqualification
2.	Overseer / Junior Draughting Officer	Refer table in para No.3	
3.	Junior Technical Assistant	1853	

4.	Technical Assistant (Electrical)	3591	Standar III or better, Colour vision defective and Night blindness will be a disqualification
5.	Junior Engineer	3662	Standard III or better, Colour blindness to be a disqualification
6.	Assistant Agricultural Officer	3101	
7.	Assistant Horticultural Officer	3104	
8.	Mines Surveyor	3674	Standard III or better
9.	Assistant Manager (Mines)	3654	
10.	Junior Draughting Officer	3115	
11.	Hostel Superintendent cum Physical Training Officer	1731	
12.	Junior Draughting Officer	3547	
13.	Surveyor	3378	
14.	Technical Assistant (Civil)	3549	
15.	Technical Assistant (Electrical)	3550	
16.	Junior Burner	3651	
17.	Junior Foreman (Factory)	3652	
18.	Junior Training Officer (Architectural Draughtsman)	3615	
19.	Junior Training Officer (Basic Designer & Virtual Verifier)	3617	
20.	Junior Training Officer (Computer Hardware & Network Maintenance)	3618	
21.	Junior Training Officer (Advanced Computer Numerical Control Machining Technician)	3619	
22.	Junior Training Officer (Draughtsman Civil)	3620	
23.	Junior Training Officer (Engineering Drawing)	3621	
24.	Junior Training Officer (Electronics Mechanic)	3622	
25.	Junior Training Officer (Electrician)	3623	
26.	Junior Training Officer (Fashion Design and Technology)	3624	
27.	Junior Training Officer (Fitter)	3625	
28.	Junior Training Officer (Food Production)	3626	
29.	Junior Training Officer (Information & Communication Technology System Maintenance)	3627	
30.	Junior Training Officer (In-Plant Logistics Assistant)	3628	
31.	Junior Training Officer (Industrial Robotics and Digital Manufacturing Technician)	3629	
32.	Junior Training Officer (Machinist)	3630	
33.	Junior Training Officer (Workshop Calculation and Science)	3631	
34.	Junior Training Officer (Mechanic Auto Body Repair)	3632	
35.	Junior Training Officer (Mechanic Two and Three Wheeler)	3633	
36.	Junior Training Officer (Mechanic Electric Vehicle)	3634	
37.	Junior Training Officer (Mechanic Motor Vehicle)	3635	
38.	Junior Training Officer (Manufacturing Process control and Automation)	3636	

39.	Junior Training Officer (Refrigeration and Air Conditioner Technician)	3637	Standard III or better
40.	Junior Training Officer (Operator Advanced Machine Tool)	3638	
41.	Junior Training Officer (Pump Operator cum Mechanic)	3639	
42.	Junior Training Officer (Sewing Technology)	3640	
43.	Junior Training Officer (Smartphone Technician cum App Tester)	3641	
44.	Junior Training Officer (Solar Technician (Electrical))	3642	
45.	Junior Training Officer (Surveyor)	3643	
46.	Junior Training Officer (Technician Medical Electronics)	3644	
47.	Junior Training Officer (Textile Mechatronics)	3645	
48.	Junior Training Officer (Turner)	3646	
49.	Junior Training Officer (Welder)	3647	
50.	Junior Training Officer (Wireman)	3648	
51.	Junior Tradesman (MMV)	Refer table in para No.3	
52.	Junior Tradesman (Electrician)		
53.	Junior Tradesman (Welder)		
54.	Junior Tradesman (Fitter)		
55.	Junior Tradesman (Diesel Mechanic)	3656	
56.	Junior Tradesman (AC Mechanic)	3661	
57.	Junior Tradesman (Sheet Metal)	3660	
58.	Assistant Rubber Maker	3258	

4.3.3. Candidates with defective vision should upload an Eye Fitness certificate from a qualified Eye Specialist working in a Government Hospital at the time of joining the post, to the Appointing Authority.

4.3.4. Candidates who have applied for the posts of Chemist, Grade-I (Post Code: 3679), Overseer /Junior Draughting Officer in Rural Development and Panchayat Raj Department (refer table in para No 3), Junior Technical Assistant (Post Code: 1853), Junior Engineer (Post Code: 3662), Assistant Agricultural Officer (Post Code: 3101), Assistant Horticultural Officer (Post Code: 3104) and Technical Assistant (Electrical) (Post Code: 3591) should upload eye fitness certificate from the specialist in Ophthalmology working in the Government Hospital in the format prescribed in Annexure VI at the time of submission of online application failing which his / her application will not be considered for the said posts.

4.3.5. Posts of Junior Tradesman (Mechanic Motor Vehicle, Electrician, Welder, Fitter, AC Mechanic, Diesel Mechanic and Sheet Metal) in Tamil Nadu State Transport Corporation

4.3.5.1. Candidates must possess the following minimum physical standards;

Height (cm)	Weight (kg)
152	45

4.3.5.2. Candidates possessing the above-said minimum physical standards are only eligible to apply for these posts. The candidates who have applied for the posts of Junior Tradesman (Post code: refer table in para. No.3) should upload the certificate of physical standards obtained from a Medical Officer, above the rank of an Assistant Surgeon appointed by the Government to a Government Medical Institution in the format prescribed in Annexure VI of Notification at the time of submission of online application failing which his / her application will not be considered for the said posts.

4.3.5.3. Senior Civil Surgeon, Civil Surgeon, Senior Assistant Surgeon, Resident Medical Officer, Assistant Professor, Senior Assistant Professor, Designate Professor of Medicine and Professor of Paediatrics are the competent authorities to issue the certificate of physical standards.

4.4. Knowledge in Tamil:

4.4.1. Candidates should possess adequate knowledge in Tamil on the date of this Notification. The candidate shall be deemed to possess an adequate knowledge of Tamil if, he / she has passed the SSLC examination or its equivalent examination / HSC / Degree, etc., with Tamil as one of the languages or studied the High School Course in Tamil medium; or passed the SSLC examination or its equivalent examination in Tamil medium; or passed the Second Class Language Test (Full Test) in Tamil conducted by the Tamil Nadu Public Service Commission.

4.4.2. Candidates must upload either SSLC / HSC / Degree / PG Degree mark sheets or proof of having passed the Second Class Language Test (Full Test) in Tamil conducted by the Tamil Nadu Public Service Commission, at the time of submission of online application.

4.4.3. Failure to produce documents in support of the possession of adequate knowledge of Tamil, shall result in the candidate being required to pass the Second Class Language Test (Full Test) in Tamil conducted by the Commission, within a period of two years from the date of his / her appointment, failing which he / she shall be discharged from service.

4.5. Restrictions on applying for the Examination:

4.5.1. The candidates not belonging to SCs, SC(A)s, STs, MBCs/DCs, BC(OBCM)s, and BCMs, who have put in 5 years or more of service, since his/ her first appointment to a service of Government of India or Government of a State / Union Territory, are not eligible to apply even if they are within the age limit.

4.5.2. The persons with benchmark disabilities are not eligible for the following posts;

S. No.	Name of the Post	Post Code	Department / Organization
1.	Chemist, Grade-I (Institute of Ceramic Technology, Viruthachalam)	3679	Industries and Commerce
2.	Mines Surveyor	3674	Tamil Nadu Minerals Limited
3.	Assistant Manager (Mines)	3654	Tamil Nadu Magnesite Limited

4.6. Posts identified suitable for Persons with Benchmark Disability:

4.6.1. The following posts are identified as suitable for reservation to persons with benchmark disabilities as detailed below:

S. No.	Name of the Post	Post Code	Suitable Category of Benchmark Disabilities
1.	Junior Technical Assistant	1853	All categories
2.	Junior Draughting Officer	3115	
3.	Junior Draughting Officer	3547	
4.	Surveyor	3378	
5.	Overseer / Junior Draughting Officer	Refer table in para no.3	
6.	Junior Tradesman (MMV)		
7.	Junior Tradesman (Electrician)		
8.	Junior Tradesman (Welder)		
9.	Junior Tradesman (Fitter)		

10.	Junior Tradesman (Diesel Mechanic)	3656	All categories
11.	Junior Tradesman (AC Mechanic)	3661	
12.	Junior Tradesman (Sheet Metal)	3660	
13.	Junior Training Officer (Architectural Draughtsman)	3615	
14.	Junior Training Officer (Basic Designer and Virtual Verifier)	3617	
15.	Junior Training Officer (Computer Hardware and Network Maintenance)	3618	
16.	Junior Training Officer (Advanced Computer Numerical Control Machining Technician)	3619	
17.	Junior Training Officer (Draughtsman Civil)	3620	
18.	Junior Training Officer (Engineering Drawing)	3621	
19.	Junior Training Officer (Electronics Mechanic)	3622	
20.	Junior Training Officer (Electrician)	3623	
21.	Junior Training Officer (Fashion Design and Technology)	3624	
22.	Junior Training Officer (Fitter)	3625	
23.	Junior Training Officer (Food Production)	3626	
24.	Junior Training Officer (Information and Communication Technology System Maintenance)	3627	
25.	Junior Training Officer (In-Plant Logistics Assistant)	3628	
26.	Junior Training Officer (Industrial Robotics and Digital Manufacturing Technician)	3629	
27.	Junior Training Officer (Machinist)	3630	
28.	Junior Training Officer (Workshop Calculation and Science)	3631	
29.	Junior Training Officer (Mechanic Auto Body Repair)	3632	
30.	Junior Training Officer (Mechanic Two & Three Wheeler)	3633	
31.	Junior Training Officer (Mechanic Electric Vehicle)	3634	
32.	Junior Training Officer (Mechanic Motor Vehicle)	3635	
33.	Junior Training Officer (Manufacturing Process control and Automation)	3636	
34.	Junior Training Officer (Refrigeration and Air Conditioner Technician)	3637	
35.	Junior Training Officer (Operator Advanced Machine Tool)	3638	
36.	Junior Training Officer (Pump Operator cum Mechanic)	3639	
37.	Junior Training Officer (Sewing Technology)	3640	
38.	Junior Training Officer (Smartphone Technician cum App Tester)	3641	
39.	Junior Training Officer (Solar Technician (Electrical))	3642	
40.	Junior Training Officer (Surveyor)	3643	
41.	Junior Training Officer (Technician Medical Electronics)	3644	

42.	Junior Training Officer (Textile Mechatronics)	3645	All categories
43.	Junior Training Officer (Turner)	3646	
44.	Junior Training Officer (Welder)	3647	
45.	Junior Training Officer (Wireman)	3648	
46.	Assistant Agricultural Officer	3101	
47.	Technical Assistant (Civil)	3549	
48.	Technical Assistant (Electrical)	3550	
49.	Junior Burner	3651	
50.	Junior Foreman (Factory)	3652	
51.	Technical Assistant (Electrical)	3591	
52.	Assistant Rubber Maker	3258	
53.	Hostel Superintendent cum Physical Training Officer	1731	All categories except Visually Impaired
54.	Assistant Horticultural Officer	3104	LV, HH, LD, CP, LC, DF, AC, MuD, ASD, SLD, MI
55.	Junior Engineer	3662	LV, HI, HH, LD, LC, DF, AC, MD

Abbreviations:

LV	– Low Vision	CP	– Cerebral Palsy
VI	– Visually Impaired	LC	– Leprosy Cured
HH	– Hard of Hearing	AC	– Acid Attack Victims
HI	– Hearing Impaired	DF	– Dwarfism
LD	– Locomotor Disability	MuD	– Muscular Dystrophy
ASD	– Autism Spectrum Disorder	SLD	– Specific Learning Disability
MI	– Mentally Ill	MD	– Multiple Disabilities

4.6.2. Persons with Benchmark Disability with only those category (ies) of disability (ies) mentioned above shall be eligible to apply for this examination under Persons with Benchmark Disability category. Therefore, candidates concerned are advised to read it carefully before applying appropriately for admission to the Examination.

5. Plan of Examination:

5.1. The Combined Technical Services Examination (Diploma / ITI) will be conducted as single stage Written Examination. The candidates will be admitted to the examination, based on the claims made in the online application.

5.2. Ranking Procedure:

5.2.1. The merit list or ranking list shall be prepared on the basis of total marks secured by the candidates in the written examination. Marks obtained by the candidates in the examination (Part B and Part C of Paper I and Paper II) would determine final ranking.

5.2.2. In cases of two or more candidates scoring equal marks, the candidate possessing the higher qualification shall be placed above in the merit list.

5.2.3. When the marks obtained in the written examination and the qualification are also the same, then the candidate senior in age shall be placed above in the merit list.

5.2.4. When the age too is the same, then the candidate who has submitted his application earlier to the Commission, as determined from the application number, shall be placed above in the merit list.

5.3. Onscreen certificate verification will be conducted before admission to the physical certificate verification and counselling. The Commission will draw a list of candidates to be qualified for the onscreen certificate verification based on the criterion of minimum qualifying marks as mentioned in para 6 of the notification and rule of reservation of appointments. For the posts not requiring experience the candidates will be admitted to onscreen certificate verification in the ratio of 1:3 / 1:2 for General category and all reserved categories respectively. For the posts requiring experience the candidates will be admitted to onscreen certificate verification in the ratio of 1:5 for all categories.

5.4. The experience certificate uploaded by the candidates will be verified by the Head of the Department / Organization concerned, during onscreen certificate verification. The committee can reject the experience certificate of the candidate after due process. The decision of the committee is final.

5.5. After onscreen certificate verification, based on the marks obtained in the written examination and subject to the rule of reservation of appointments, candidates will be admitted to physical certificate verification and counselling (wherever applicable). For the posts requiring counselling, the candidates will be admitted to physical certificate verification and counselling in the ratio of 1:3 and 1:1.5 for General category and all reserved categories respectively. For the posts not requiring counselling, candidates will be admitted to physical certificate verification in the ratio of 1:1.2 for all categories.

5.6. In respect of posts whose total cadre strength is one only and for which the rule of reservation of appointments does not apply, the number of candidates to be admitted to the physical certificate verification and counselling (wherever applicable) on the basis of the marks obtained in the written examination will be three.

5.7. The final selection will be made based on the total marks obtained by the candidate in the Examination (Part B and Part C of Paper I and Paper II) subject to rule of reservation of appointments. Candidates will be allowed to participate in counselling (wherever applicable) based on his / her rank.

5.8. Appearance in Paper I and Paper II is compulsory. Candidates who have not appeared either for Paper I or Paper II will not be considered for selection, even if they secure the minimum qualifying marks.

6. Scheme of Examination:

Subject	Standard	No. of Questions	Duration	Maximum Marks	Minimum Qualifying Marks		Type of Examination	Mode of Examination
					SCs, SC(A)s, STs, MBCs/DCs, BC(OBCM)s and BCMs	Others*		
Paper I								
Part A Tamil Eligibility Test	SSLC	100	3 hours	150	60	60	Objective	OMR
Part B General Studies		75		150	135	180		
Part C Aptitude and Mental Ability		25						
Paper II Subject Paper	Diploma / ITI	200	3 hours	300				CBT
Total (Part B & C of Paper-I and Paper-II)				450				
*Others - Candidates not belonging to SCs, SC(A)s, STs, MBCs/DCs, BC(OBCM)s and BCMs								
OMR - Optical Mark Recognition; CBT - Computer Based Test								

6.1. Paper II – Subject Paper

Name of the Post	Post Code	Subject Paper	Subject Code	Standard	Language of Question Paper
Chemist, Grade-I	3679	Chemical Engineering and Technology	452	Diploma	English
Mines Surveyor	3674	Civil and Mining Engineering	574	Diploma	English
Assistant Manager (Mines)	3654	Mining Engineering	346	Diploma	English
Junior Engineer	3662	Civil Engineering	443	Diploma	English and Tamil
Junior Technical Assistant	1853	Handloom Technology, Textile Technology and Textile Manufacture	445	Diploma	English
Overseer /Junior Draughting Officer	Refer table in para No.3	Civil Engineering	443	Diploma	English and Tamil
Junior Draughting Officer	3115	Civil Engineering	443	Diploma	English and Tamil
Hostel Superintendent cum Physical Training Officer	1731	Physical Education	354	Diploma	English and Tamil
Junior Draughting Officer	3547	Civil Engineering	443	Diploma	English and Tamil
Assistant Rubber Maker	3258	Rubber and Polymer Technology	576	Diploma	English

Surveyor	3378	Trade: Surveyor	387	I.T.I	English and Tamil
Junior Training Officer (Architectural Draughtsman)	3615	Trade: Architectural Draughtsman	531	I.T.I	English and Tamil
Junior Training Officer (Basic Designer and Virtual Verifier)	3617	Trade: Basic Designer and Virtual Verifier	532	I.T.I	English and Tamil
Junior Training Officer (Computer Hardware and Network Maintenance)	3618	Trade: Computer Hardware and Network Maintenance	533	I.T.I	English and Tamil
Junior Training Officer (Advanced Computer Numerical Control Machining Technician)	3619	Trade: Advanced Computer Numerical Control Machining Technician	534	I.T.I	English and Tamil
Junior Training Officer (Draughtsman Civil)	3620	Trade: Draughtsman Civil	388	I.T.I	English and Tamil
Junior Training Officer (Engineering Drawing)	3621	Trade: Engineering Drawing and Draughtsman (Mechanical and Civil)	551	I.T.I	English and Tamil
Junior Training Officer (Electronics Mechanic)	3622	Trade: Electronics Mechanic	535	I.T.I	English and Tamil
Junior Training Officer (Electrician)	3623	Trade: Electrician	438	I.T.I	English and Tamil
Junior Training Officer (Fashion Design and Technology)	3624	Trade: Fashion Design and Technology	570	I.T.I	English and Tamil
Junior Training Officer (Fitter)	3625	Trade: Fitter	436	I.T.I	English and Tamil
Junior Training Officer (Food Production)	3626	Trade: Food Production (General)	536	I.T.I	English and Tamil
Junior Training Officer (Information and Communication Technology System Maintenance)	3627	Trade: Information and Communication Technology System Maintenance	537	I.T.I	English and Tamil
Junior Training Officer (In-Plant Logistics Assistant)	3628	Trade: In-Plant Logistics Assistant	569	I.T.I	English and Tamil
Junior Training Officer (Industrial Robotics and Digital Manufacturing Technician)	3629	Trade: Industrial Robotics and Digital Manufacturing Technician	538	I.T.I	English and Tamil
Junior Training Officer (Machinist)	3630	Trade: Machinist	539	I.T.I	English and Tamil
Junior Training Officer (Workshop Calculation and Science)	3631	Trade: Workshop Calculation Science	540	I.T.I	English and Tamil
Junior Training Officer (Mechanic Auto Body Repair)	3632	Trade: Mechanic Auto Body Repair	541	I.T.I	English and Tamil
Junior Training Officer (Mechanic Two and Three Wheeler)	3633	Trade: Mechanic Two and Three Wheeler	553	I.T.I	English and Tamil

Junior Training Officer (Mechanic Electric Vehicle)	3634	Trade: Mechanic Electric Vehicle	542	I.T.I	English and Tamil
Junior Training Officer (Mechanic Motor Vehicle)	3635	Trade: Mechanic Motor Vehicle	437	I.T.I	English and Tamil
Junior Training Officer (Manufacturing Process control and Automation)	3636	Trade: Manufacturing Process control and Automation	543	I.T.I	English and Tamil
Junior Training Officer (Refrigeration and Air Conditioner Technician)	3637	Trade: Mechanic Refrigeration and Air Conditioner Technician	435	I.T.I	English and Tamil
Junior Training Officer (Operator Advanced Machine Tool)	3638	Trade: Operator Advanced Machine Tool	544	I.T.I	English and Tamil
Junior Training Officer (Pump Operator cum Mechanic)	3639	Trade: Pump Operator cum Mechanic	545	I.T.I	English and Tamil
Junior Training Officer (Sewing Technology)	3640	Trade: Sewing Technology	546	I.T.I	English and Tamil
Junior Training Officer (Smartphone Technician cum App Tester)	3641	Trade: Smartphone Technician cum App Tester	547	I.T.I	English and Tamil
Junior Training Officer (Solar Technician (Electrical))	3642	Trade: Solar Technician (Electrical)	548	I.T.I	English and Tamil
Junior Training Officer (Surveyor)	3643	Trade: Surveyor	387	I.T.I	English and Tamil
Junior Training Officer (Technician Medical Electronics)	3644	Trade: Technician Medical Electronics	549	I.T.I	English and Tamil
Junior Training Officer (Textile Mechatronics)	3645	Trade: Textile Mechatronics	568	I.T.I	English and Tamil
Junior Training Officer (Turner)	3646	Trade: Turner, Tool and Die Maker	552	I.T.I	English and Tamil
Junior Training Officer (Welder)	3647	Trade: Welder (Gas & Electric)	440	I.T.I	English and Tamil
Junior Training Officer (Wireman)	3648	Trade: Wireman	550	I.T.I	English and Tamil
Assistant Agricultural Officer	3101	Agriculture	431	Diploma	English and Tamil
Assistant Horticultural Officer	3104	Horticulture	432	Diploma	English and Tamil
Technical Assistant (Civil)	3549	Civil Engineering	443	Diploma	English and Tamil
Technical Assistant (Electrical)	3550	Electrical and Electronics Engineering	446	Diploma	English and Tamil
Technical Assistant (Electrical)	3591	Electrical and Electronics Engineering	446	Diploma	English and Tamil
Junior Burner	3651	Chemical Engineering and Technology	452	Diploma	English
Junior Foreman (Factory)	3652	Mechanical Engineering	441	Diploma	English and Tamil
Junior Tradesman (Mechanic Motor Vehicle)	3655	Trade: Mechanic Motor Vehicle	437	I.T.I	English and Tamil
Junior Tradesman (Electrician)	3659	Trade: Electrician	438	I.T.I	English and Tamil

Junior Tradesman (Welder)	3658	Trade: Welder (Gas & Electric)	440	I.T.I	English and Tamil
Junior Tradesman (Fitter)	3657	Trade: Fitter	436	I.T.I	English and Tamil
Junior Tradesman (Diesel Mechanic)	3656	Trade: Diesel Mechanic	521	I.T.I	English and Tamil
Junior Tradesman (AC Mechanic)	3661	Trade: Mechanic Refrigeration and Air-Conditioner Technician	435	I.T.I	English and Tamil
Junior Tradesman (Sheet Metal)	3660	Trade: Sheet Metal	520	I.T.I	English and Tamil

6.2. The Paper II, Part B and Part C of Paper-I will be evaluated only if the candidate secures minimum qualifying marks of 40% (i.e., 60 Marks) in Part A of Paper I.

6.3. The questions in Part B and C of Paper I will be set both in English and Tamil.

6.4. The differently abled candidates can avail exemption from writing Part A in Paper I (Tamil Eligibility Test). Such candidates have to furnish the required details in the online application without fail. Subsequent claim will receive no attention. The candidates need to upload the Certificate of Disablity in the format prescribed in Annexure II of this notification.

6.5. The syllabus for the written examination is available in Annexure III of this Notification. Unit wise distribution of questions mentioned in the syllabus is only indicative. Commission reserves the right to marginally increase or decrease the number of questions in each unit if necessity arises.

6.6. The instructions to be followed while appearing for the examination, are available in Annexure IV of this Notification.

6.7. The Notification is published in English and Tamil versions. In case of doubt, English version is final.

7. Reservation of Appointments:

The rule of reservation of appointments applies to this recruitment. The details of the reservation to candidates belonging to various categories are given in Annexure II of this Notification. In respect of posts having total cadre strength as one only, the rule of reservation of appointment does not apply for the posts i.e., Chemist, Grade I (Post Code: 3679), Junior Training Officer (Architectural Draughtsman) (Post Code: 3615), Junior Training Officer (In-plant Logistics Assistant) (Post Code: 3628), Junior Training Officer (Mechanic Two and Three Wheeler) (Post Code: 3633) and Junior Training Officer (Textile Mechatronics) (Post Code: 3645)

8. Communication to Candidates:

8.1. The memorandum of admission (Hall Ticket) for eligible candidates will be made available on the Commission's website www.tnpscexams.in for downloading by candidates. The memorandum of admission will not be sent by post. The candidates must comply with every instruction given in the memorandum of admission.

8.2. The Commission will publish the written examination results, date and time of physical certificate verification, and counselling on the Commission's website (www.tnpsc.gov.in). No individual communication will be sent to the candidates by post. Candidates will be informed of the above fact only through SMS and e-mail, through the registered Mobile Number and email ID. Candidates are

directed to watch the Commission's website in this regard. The Commission shall not be responsible if the communication does not reach the candidate due to an incorrect / invalid e-mail ID / mobile number and failure / delay in delivery of SMS / email to the candidates due to any reason including technical issues. Any representation from the candidates for non-receipt of SMS or e-mail will not be responded.

9. Communication with the Commission:

9.1. Candidates requiring clarification, can contact the office of the Tamil Nadu Public Service Commission in person or over the **Toll-Free No.18004190958** on all working days between 10.00 a.m. and 5.45 p.m.

9.2. Queries relating to One Time Registration / online application may be sent to helpdesk@tnpscexams.in. Any other communication with the Commission must be made through email to grievance.tnpsc@tn.gov.in. Communications sent by post must be addressed only to the Secretary, Tamil Nadu Public Service Commission, TNPSC Road, V.O.C. Nagar, Park Town, Chennai -600003.

9.3. All communications to the Commission should invariably contain the following particulars. Communications not containing the following particulars will not be attended to

a. Name and Year of the examination
b. Notification No. and year
c. Registration No.
d. Name of the Candidate (in full and in block letters)
e. Complete postal address as given in the application
f. Valid and Active E-mail ID

9.4. Request for exemption from age limit or other qualifications will receive no attention. Requests for furnishing causes of failure in the written examination or for non-selection based on the results of the written examination or for revaluation of answer sheets will not be entertained.

10. Litigations:

The selection for appointment to the posts included in this recruitment is purely provisional subject to the final orders in the court cases, if any, pending before the Hon'ble High Court of Madras and Madurai Bench of Madras High Court, relating to this recruitment.

Secretary

Annexure I

How to Apply Online

1. **Website:** Candidates should apply only through online mode in the Commission's website viz., www.tnpscexams.in.

2. One Time Registration:

2.1. It is essential for the candidate to register himself / herself first at the One Time Registration (OTR) platform, available on the Commission's website, and then proceed to fill up the online application for the examination. Candidates should register only once in the One Time Registration by paying Rs.150/- as registration fee. Successfully registered One Time Registration is valid for five years from the date of registration.

2.2. During One Time Registration, the candidates should keep ready the scanned image of their photograph, taken within the last 3 months of size 20 KB – 50 KB and saved as "Photograph.jpg" and signature of size 10 KB – 20 KB and saved as 'Signature.jpg'. Both photograph and signature, of 200 DPI resolution, should be saved in a CD / DVD / Pen drive, to upload the same.

2.3. One Time Registration is not an application for any post. It is just a collection of information from the candidates and provides a separate dashboard to each candidate to facilitate the maintenance of their own profile. A candidate should make an online application separately for every examination for which he / she intends to appear.

2.4. A valid e-mail ID and mobile number are mandatory for One Time Registration. E-mail ID and mobile number are to be kept in 'ACTIVE' mode. Every candidate should have his / her email ID and password. No candidate should share his/her e-mail ID, password, mobile number with any other person. In case a candidate does not have a valid personal email ID, he / she should create a new email ID before applying online and must maintain that email account live. Inquiries relating to One Time Registration / online applications will be answered only if the inquiries are received through a registered e-mail ID.

2.5. Linking the Aadhaar number with One Time Registration (OTR) is mandatory for candidates. The information associated with the Aadhaar number including biometrics will be used only for identification purposes and will not be stored or shared. Candidates are requested to give their consent in their respective OTR. The Aadhaar details will be submitted to the Central Identities Data Repository (CIDR) only for authentication. Linking of the Aadhaar number is mandatory for all prospective candidates to create new OTR, renew / access the existing OTR and apply for any recruitment to be notified henceforth.

2.6. Details to be furnished during One Time Registration:

2.6.1. Candidates shall furnish their correct SSLC Register Number and Certificate Number, Month and Year of Passing, Medium of Instruction, and Name of the Board that issued the certificate while registering online. If any detail furnished is found to be wrong, the online application will be rejected at any stage after due process.

2.6.2. Candidates who have more than one SSLC mark sheet, should enter the details available in the mark sheet issued on the final attempt in which he / she had passed the SSLC examination.

2.6.3. Besides details related to SSLC, all other details required in the One Time Registration, shall be furnished without any mistake, as these details shall form the basis of all other details given subsequently by the candidate while filling the online application for each recruitment.

2.7. One-Time Registration (OTR) Edit:

2.7.1. The candidates shall be permitted to edit the details in the OTR whenever required by uploading the supporting documents.

2.7.2. Any changes in the One Time Registration must be made before the submission of the online application since the details furnished in the One Time Registration will be filled in automatically in the online application. Hence, incorrect particulars furnished in the One Time Registration may result in the rejection of online application after due process. Candidates are therefore advised to fill in the One Time Registration particulars carefully and correctly.

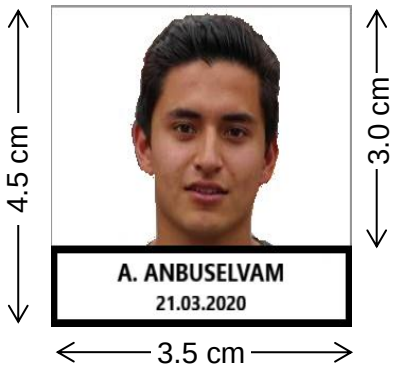
2.7.3. The Commission will not be responsible for any consequences arising out of failure on the part of the candidates to adhere to the instructions issued regarding One Time Registration or filling up of online application.

2.7.4. The instructions and illustration regarding One Time Registration are available on the website viz., www.tnpscexams.in.

3. Online Application:

3.1. A candidate who wishes to apply for any post shall click “APPLY” against the post notified on the Commission‘s website and use the same User ID and Password given for One Time Registration. User ID and Password are to be created by the candidates themselves. In case the candidate forgets the User ID and Password, he/she can retrieve or reset them using the “FORGOT PASSWORD and FORGOT USER ID” options. The Commission will not furnish User ID and Password details to the candidates.

3.2. A candidate already having user ID and password, has to login. The available One Time Registration particulars will be displayed on the screen, including the photograph furnished at the time of One Time Registration, as well as the photographs uploaded with previous online applications. Candidates shall check and confirm the One Time Registration details before proceeding further. Thereafter, the candidates shall fill up additional details required in the specific recruitment application. If any of the One Time Registration details are found to be incorrect, the same should be corrected by clicking on OTR Edit. Changes made in the One Time Registration will be reflected only in online applications to be submitted subsequently.



3.3. Candidates shall upload their photograph taken on or after the date of notification at the time of submission of each and every online application. The photograph should be in colour, of passport size, against a white background and taken in a photo studio. The candidate should be photographed in frontal view showing both ears and part of the neck. The candidate should ensure that the name of the candidate and the date of photography (i.e., on or after the date of notification) are printed at the bottom of the photograph. The face of the candidate as well as his / her name and date of photography should be clearly visible in the photograph of height 4.5 cm (170 pixels) and width 3.5 cm (130 pixels). Of the total height of the photograph, the image of the candidate shall be 3.0 cm (115 pixels) and the candidate’s name and date of photography shall be 1.5 cm (55 pixels), as illustrated above. The photograph should be saved in a digital format (in CD / DVD / pen drive / hard drive), ready for uploading.

3.4. If the photograph is not available in a digital format, a passport-size photograph showing the image of the candidate along with the name of the candidate and the date of photography printed at

the bottom, in the same dimensions as specified above, may be pasted on a plain white paper and scanned to obtain a resolution of 200 DPI. The image should then be cropped to show only the photograph of size 20KB–50KB saved as “Photograph.jpg” and uploaded. The entire sheet of white paper on which the photograph is pasted should not be scanned / uploaded. Photographs taken using cellular phones, selfies, photocopies (Xerox) of photographs, photographs taken during family functions, at tourist places, or against a backdrop of plants or buildings should not be uploaded. Photographs of nature, wildlife, buildings, etc. shall not be uploaded. In case of uploading an inappropriate photograph, in violation of the aforementioned instruction, the application is liable to be rejected after due process.

3.5. Before uploading of signature, the candidate shall draw a box of dimension 6.0 x 2.0 cm (230 pixels x 75 pixels) on white paper and sign within the box, using a blue or black ink pen. The paper should then be scanned to obtain a resolution of 200 DPI. The image should then be cropped to show only the box with the signature, of size 10 KB –20KB, and saved as “Signature.jpg” and uploaded.

3.6. Clear images of the photograph and the signature should be uploaded in the correct dimensions, size, and format. Failure to upload/upload clear images of the photograph and signature will result in the rejection of the online application after due process.

3.7. Examination Centres:

3.7.1. While applying online, candidates shall be permitted to choose two district centres as their preference for the Written Examination. Candidates shall be allotted a venue in one of these two district centres. However, candidates with benchmark disability, shall be permitted to choose only one district centre and shall be allotted a venue in that district centre.

3.7.2. Candidates must appear for the examination at the venue they have been allotted, as mentioned in the memorandum of admission (hall ticket). Request for change of examination centre will not be permitted.

3.7.3. The Commission reserves the right to increase or decrease the number of examination centres and to re-allot the candidates accordingly. The Commission also reserves the right to allot a candidate to the nearby centre, if he / she could not be accommodated in the centres opted by the candidate.

3.7.4. The written examination will be held at the centres given below:

S.No.	Name of the Centre	Code	S.No.	Name of the Centre	Code
1.	Ariyalur	3001	21.	Ranipet	3501
2.	Chengalpattu	3301	22.	Salem	1701
3.	Chennai	0101	23.	Karaikudi	1805
4.	Coimbatore	0201	24.	Tenkasi	3601
5.	Chidambaram	0303	25.	Thanjavur	1901
6.	Dharmapuri	0401	26.	The Nilgiris	1301
7.	Dindigul	0501	27.	Theni	2001
8.	Erode	0601	28.	Thiruvallur	2101
9.	Kallakurichi	3401	29.	Thiruvannamalai	2201
10.	Kancheepuram	0701	30.	Thiruvarur	2301
11.	Nagercoil	0801	31.	Thoothukudi	2401
12.	Karur	0901	32.	Tiruchirappalli	2501
13.	Krishnagiri	3101	33.	Tirunelveli	2601
14.	Madurai	1001	34.	Tirupathur	3701
15.	Mayiladuthurai	3801	35.	Tiruppur	3201
16.	Nagapattinam	1101	36.	Vellore	2701
17.	Namakkal	1201	37.	Villupuram	2801
18.	Perambalur	1401	38.	Virudhunagar	2901
19.	Pudukkottai	1501			
20.	Ramanathapuram	1601			

3.8. Application Preview:

3.8.1. Candidates should carefully fill in the details in the online application at the appropriate places and click on the 'SAVE AND PROCEED' button at the end of each page of the application. Before pressing the 'SAVE AND PROCEED' button, candidates are advised to verify each particular field in the application.

3.8.2. Candidates can edit/add/delete any information while filling the online application. Before finally submitting the application, candidates will be given the option of seeing a preview of their application. As soon as a candidate clicks the button meant for preview, an SMS will be sent to the registered mobile number, informing the availability of such a preview in the registered email ID provided by the candidate.

3.8.3. Once the candidate desires to make modifications based on the preview arrangement as indicated in the paragraph above, he/she may re-open the application and make necessary modifications using the Edit option and make the final submission of the corrected application, before the last date prescribed for submission of the online application. It is the responsibility of the candidate to carefully check the details available in the preview and make suitable corrections, if any, in the application / OTR before final submission. The candidate will be solely responsible for any non-rectification or non-submission of the application.

3.8.4. An individual is considered to have applied for a recruitment, if and only if, he / she finally submits the application, by clicking the 'SUBMIT' button. The mere availability of a preview shall not be tantamount to "having applied" for a particular recruitment.

3.9. Examination Fee:

3.9.1. The examination fee of Rs.100 (Rupees One hundred only) should be paid at the time of submitting the online application for this recruitment, unless exemption of fee is claimed.

3.9.2. For every additional subject paper opted by the candidate in the online application Rs.100 for each subject paper should be paid additionally. Further, if he / she withdraws one or more subject paper(s) then the fee already paid by the candidate will not be refunded.

3.9.3. Candidates belonging to special categories can avail of exemption from paying examination fees as per eligibility criteria. For further details refer to Annexure II of this Notification.

3.9.4. The total number of free chances availed, will be calculated based on claims made in previous applications. The number of free chances availed by the candidate may be verified by the Commission at any stage of the selection process. In case a candidate makes a false claim for exemption from payment of the application fee by suppressing information regarding his/her previous application(s), his / her candidature shall be rejected after due process and he / she shall be debarred for a period of one year, from appearing for examinations conducted by the Commission.

3.9.5. Candidates are directed to carefully choose the option "Yes" or "No" regarding availing of the fee concession. The choice made, cannot be modified or edited after successful submission of the online application. Candidates are advised in their own interest, to keep an account of the number of times fee concession has been availed, irrespective of the information displayed in the <Application History> of the candidate dashboard.

3.9.6. An application (irrespective of the post applied for) claiming fee concession will operate to exclude one chance from the number of free chances allowed. Candidates who have availed the maximum number of free chances permitted / candidates who do not wish to avail of the fee concession / candidates who are not eligible for fee concession shall choose the option "No" against the query regarding fee concession. Such candidates shall thereafter pay the requisite fee through the prescribed mode of payment.

3.9.7. Failure to pay the prescribed fee in time, along with the online application, will result in the rejection of the application after due process.

3.10. Examination Fee Payment:

3.10.1. After submitting the details in the online application, the candidates can pay the examination fee by online mode through Net Banking / Credit card / Debit card / UPI on or before the last date of submission of the online application by choosing the option in the online application. Candidates have to pay the service charges also as applicable.

3.10.2. Offline mode of payment if any received in the form of Demand Draft / Postal Order etc. will not be accepted and the applications forwarded with such modes of payment will be summarily rejected and the same will not be returned or refunded.

3.10.3. To facilitate payment of fees through the online mode, an additional page of the application format will be displayed wherein candidates may follow the instructions and fill in the requisite details to make payment. There is a possibility of online payment failure. Hence, if the online payment fails, candidates can check the status of the earlier transaction. If the earlier transactions have failed, the candidate shall retry paying the fee again by online mode. In case of online payment failure, the amount debited from the candidate's account will be reverted to his/her account. The candidates have been given a provision to check the status of the transaction made. If all the attempts/transactions have failed, candidates have to make the payment again. The Commission is not responsible for online payment failure. It is the responsibility of the candidates to ensure that the transaction made by them is successful.

3.10.4. After submitting the payment information in the online application format, wait for the intimation from the server. Meanwhile, DO NOT press 'Back' or 'Refresh' button to avoid payment failure or double payment.

3.10.5. If the online transaction has been successfully completed, an Application Number / Applicant ID will be generated. Candidates should note the Application Number / ID for future reference in respect of the recruitment applied for.

3.10.6. Tamil Nadu Public Service Commission reserves the right to change the mode of payment at any time.

3.11. Online Application Edit:

3.11.1. The candidates shall be permitted to edit all the details in the online application till the last date stipulated for submission of the online application.

3.11.2. If the candidate desires to change his / her photograph and/or signature in his / her online application, the candidate shall select the edit option in the online application to re-upload them which must be saved finally before submitting the online application.

3.11.3. Some of the information contained in the online application has been brought forward from the candidate's one-time registration. If such information has to be edited in the online application, the candidate shall select the edit profile option in One Time Registration (OTR) and shall make and save necessary corrections. After doing so, the candidate shall select the edit option in the online application and edit the details as desired. The candidate shall save the changes and submit it finally. The candidate shall take a printout of the same if required.

3.11.4. After editing the online application, if the edited details are not finally saved and submitted by the candidate, the details provided by the candidate in the application submitted before editing shall only be considered. If the candidate has to pay a fee based on the edited details, the candidate shall pay the prescribed examination fee in online. Candidates who have already paid the examination fee are not required to pay.

3.12. Application Correction Window:

3.12.1. After the last date for submission of the online application, the Online Application Correction Window shall open for 3 days as mentioned in Para 1 'Important Instructions' of this Notification. During this period, candidates will be able to edit the details in their online application. After the last date of the Correction Window period, no modification is allowed in the online application.

3.12.2. The applications shall be processed as per the details finally furnished by the candidates. It is the responsibility of the candidates and the Commission has no liability for subsequent rejection of the application consequent to the editing details already submitted in the online application. Request / representation received for modification of claims in the online application, in any mode shall not be entertained.

3.13. Candidates are advised in their own interest to apply online much before the closing date and not to wait till the last date to avoid the possibility of disconnection / inability / failure to log on to the Commission's website on account of heavy load on internet / website.

3.14. The Commission does not assume any responsibility for the candidates not being able to submit their online applications within the last date on account of the aforesaid reasons or for any other reason beyond the control of the Commission.

3.15. Candidates need not send the printout of the online application or any other supporting documents to the Commission by post unless asked for specifically.

3.16. The name of the candidate or the name of his / her father or mother, should be spelt correctly in the application as it appears in the certificates / mark sheets.

3.17. Any discrepancy between the details as given in the online application and the documents submitted shall result in the summary rejection of candidature after due process.

3.18. The Commission will not be responsible for any consequences arising out of furnishing of incorrect and / or incomplete details in the application or omission to provide the required details in the application.

3.19. Upload of Documents:

3.19.1. Candidates should upload the required documents of proof in respect of all the claims made in the application with reference to this notification while applying for this examination. If the required certificates are not uploaded by the candidate, within the stipulated time, his / her candidature will be rejected after due process.

3.19.2. The candidates shall have the option of verifying the uploaded certificates / documents through their OTR. If any of the certificates / documents have wrongly been uploaded or not uploaded or if any modifications are to be done in the uploading of documents, the candidates shall be permitted to upload / re-upload the documents till two days prior to the date of hosting of hall tickets for that particular examination. (i.e., twelve days prior to the date of examination).

3.19.3. The uploaded credentials shall be mapped with the One Time Registration of the respective candidate along with the Application number and Notification Number (i.e., with reference to the notification for each post), so that they can be used during future submission of application by the same candidates.

3.19.4. The documents uploaded by the candidates shall be linked with OTR and retained in the server for a maximum period of two years. If the candidate applies subsequently for other posts within two years, the documents that were already uploaded shall be displayed to the candidate during the online application process for confirmation and the same need not once again be uploaded by the candidates. If the candidate applies to other posts after the period of retention i.e. two years, the candidate shall be instructed to upload all the documents afresh.

4. Information regarding criminal cases / disciplinary cases:

4.1. Candidates who have declared pending criminal or disciplinary cases in their online application, must upload a copy of the First Information Report (FIR) or memorandum of charges / show cause notice, as the case may be. Failure to upload such papers at the time of submission of online application, shall result in rejection of candidature after due process.

4.2. Candidates who have declared conviction in criminal cases or punishment in disciplinary cases, in their online application, must upload the relevant court orders and / or release orders or memorandum of proceedings, as the case may be, at the time of submission of online application. Failure to upload such papers shall result in the rejection of candidature after due process.

4.3. In case any criminal case is filed / disciplinary action is taken against or conviction / punishment is imposed on a candidate after submission of the online application, at any stage of the recruitment process before the completion of the entire selection process, such candidates should report this fact to the Commission in the next immediate stage when Commission calls for uploading documents. Failure to comply with these instructions shall result in the rejection of candidature after due process and debarment for a period of one year.

4.4. The pendency of disciplinary cases / criminal cases shall in no way affect the selection prospects of candidates. However, failure to inform such pendency, shall result in the rejection of candidature after due process.

4.5. The selection of the candidates against whom the criminal case / disciplinary case is pending, will be withheld subject to the outcome of the pending criminal / disciplinary case.

5. Employment Details:

5.1. Candidates who are in the service of the Indian Union or a State in India or in the employment of Local Bodies or Universities or Quasi Government Organizations or Public Sector Units constituted under the authority of the Government of India or of a State in India, in regular service, must inform the Commission of such fact, at the time of applying. Suppression of the fact of employment by candidates shall result in rejection of candidature after due process.

5.2. Candidates need not send their applications through their Head of Department or employer. Instead, they may directly apply to the Commission after duly informing their employer in writing that they are applying for the particular recruitment, subject to the condition that they should produce 'No Objection Certificate' in the format prescribed as shown below.

No Objection Certificate

This is to certify that Thiru/Tmt./Selvi. …… (Name) employed as …… (designation) in this office from ……(specify the date from which appointed), who is regularly / temporarily appointed and who is as probationer / approved probationer / full member, had applied for the post of ……..…….in ……..……..service called for by the Tamil Nadu Public Service Commission through online application form to the Tamil Nadu Public Service Commission and informed the fact to this department / organisation. This department / organisation has 'no objection' for processing the said application of the individual by the Tamil Nadu Public Service Commission subject to the condition that the particulars furnished by the individual are found to be correct.

Appointing Authority
(Signature with Seal)

* In the case of a Government servant against whom departmental or criminal proceedings are contemplated or pending, the appointing authority shall inform the said fact to the Tamil Nadu Public

Service Commission along with the "No Objection Certificate" and shall also inform the Tamil Nadu Public Service Commission about the initiation of departmental or criminal proceedings, if any, subsequently, till the date of his / her actual relief from the office to take up appointment in the post for which he / she has been selected.

5.3. Candidates who secure employment after submission of online application, must upload a ‘No Objection Certificate’ or at least an undertaking regarding the fact of employment and that ‘No Objection Certificate’ has been applied for. Failure to upload the ‘No Objection Certificate’ / an undertaking shall result in the rejection of candidature after due process.

5.4. Candidates who have been removed / dismissed / resigned from a post, shall intimate such fact to the Commission, through the One Time Registration Dashboard. Any failure in this regard shall result in the rejection of the candidature after due process.

5.5. Any change in the employment status of the candidate, whether appointment to or resignation / removal / dismissal, from a post, at any stage of the recruitment process, until completion of the entire selection process, must be informed to the Commission. Any failure in this regard shall result in the rejection of the candidature after due process.

5.6. Failure on the part of employed candidates to upload the ‘No Objection Certificate’ shall result in the rejection of candidature after due process.

Annexure II

1. Ex-Servicemen:

1.1. 'Ex-Serviceman' means,

1.1.1. any person who had served in any rank (whether as combatant or not) in the Armed Forces of the Union for a continuous period of not less than six months after attestation, if released between 1st July 1979 and 30th June 1987 (both days inclusive):

a. for reasons other than at his own request or by way of dismissal or discharge on account of misconduct or inefficiency; or
b. at his own request after serving for a period of not less than five years; or

1.1.2. any person who had served in any rank (whether as combatant or not) in the Armed Forces of the Union, and had retired or had been released on or after 1st July 1987 from such service:

a. at his own request after earning his pension; or
b. on medical grounds attributable to military service or circumstances beyond his control and awarded medical or other disability pension; or
c. otherwise than at his own request after earning his pension, as a result of reduction in establishment; or
d. after completing specific period of engagement, otherwise than at his own request or by way of dismissal or discharge on account of misconduct or inefficiency and has been given a gratuity.

1.1.3. any person of the Territorial Army of the following categories, namely, pension holder for continuous embodied service, person with disability attributable to military service and gallantry award winner retired on or after 15th November 1986; or

1.1.4. any person of the Army Postal Service, who retired on or after 19th July 1989 directly from the said service without reversion to Postal and Telegraph Department with pension or who has been released on or after 19th July 1989 from such service on medical grounds attributable to military service or circumstances beyond his control and awarded medical or other disability pension; or

1.1.5. any person who was on deputation in the Army Postal Service for more than 6 months prior to the 14th day of April 1987; or

1.1.6. any person who was boarded out or released on medical grounds and granted medical or disability pension; or

1.1.7. any person discharged on or after July 1987 under Army Rule 13(3) III (V) for the reason that his service is no longer required and in receipt of pension; or such other person as may be notified by the Government from time to time.

1.2. Ex-Servicemen does not mean the wards / dependants of those mentioned above.

1.3. A person discharged before July 1987 under Army Rule 13(3) III (V) for the reason that his service is no longer required is not an Ex-Serviceman.

1.4. In all cases, an Ex-Serviceman once recruited to a post in any class or service or category, cannot claim the concession of being called an Ex-Serviceman for his further recruitment.

1.5. Persons serving in the Armed Forces shall be eligible to apply for posts under the Government, if they are due to complete the specified term of their engagement in the Armed Forces, within one year from the last date prescribed by the Commission, for receipt of the online application in respect of a particular recruitment.

1.6. Fee Concession: Two free chances.

1.7. Reservation of Appointments: The rule of reservation of appointment to Ex-Servicemen is applicable only for the posts with upto Level 12 in the Pay Matrix in the notification. If no qualified and suitable Ex-Servicemen belonging to a particular category is available for selection for appointment against reserved turn, such turn shall be filled up by a candidate other than Ex-Servicemen belonging to the particulars communal category.

1.8. Supporting Documents:

1.8.1. A candidate who claims to have been demobilised from the Army or Navy or Air Force needs to upload either a properly authenticated extract from his Discharge Certificate (viz., a Bonafide Certificate) issued by the Ex-Servicemen's Welfare Board in the format as depicted below or the Pension Pay Order at the time of submission of online application.

Form of Bonafide Certificate to be produced by Ex-Servicemen

1. Name of the applicant
2. Rank held, Name of the Service (Army / Navy / Air force)
3. Date of enrolment
4. Date of discharge
5. Reasons for discharge
6. Whether an 'Ex-Serviceman' should be specifically stated
7. Whether in receipt of pension
8. P.P.O No.
9. Conduct and character while serving in the defence forces
10. Name of the post applying for
11. Unique Service No.
12. Whether the individual is employed in any post under the Government of Tamil Nadu? If so, Name of the post and date of appointment

1.8.2. Persons serving in the Armed Forces who are due to complete the specified term of their engagement in the Armed Forces, within one year from the last date prescribed by the Commission, for receipt of the online application in respect of this recruitment, shall upload at the time of submission of online application an undertaking and a certificate from their Commanding Officer in the format as depicted below.

Form of Undertaking to be given by the Serving Personnel

I hereby accept that if selected on the basis of the recruitment / examination to which this application relates, I will produce documentary evidence to the satisfaction of the appointing authority that I have been duly released / retired / discharged from the Armed Forces and I am entitled to the benefits admissible to Ex-Servicemen given under Section 63 of the Tamil Nadu Government Servants (Conditions of Service) Act, 2016.

Place: Signature of the Applicant

Form of Certificate for Serving Personnel

I hereby certify that according to the information available with me (Number) …….(Rank) ……. (Name) is due to complete the specified term of his engagement with the Armed Forces on the (date) …….

Place: Signature of the Commanding Officer
Date:

1.8.3. The candidates should also submit the Self Declaration in the format given below.

Self Declaration

1) I am aware of the fact that, as per the proviso to Section 3 (j) and 3(y) of the Tamil Nadu Government Servants (Conditions of Service) Act, 2016 (Tamil Nadu act 14 of 2016) and as per note II under para.4-A of the Commission's Instructions to Applicants, "In all cases, an ex-serviceman once recruited to a post in any class or service or category, cannot claim the concession of being called an ex-serviceman for his further recruitment".

2) I am also aware of the fact that as per para.14(P)(V) of the Commission's Instructions to Applicants "Any change in the employment status of the candidate, whether appointment to, or resignation / removal / dismissal, from a post, at any stage of the recruitment process, until completion of the entire selection process, must be informed to the Commission. Any failure in this regard shall result in rejection of candidature after due process"

3) Knowing the above facts, I (Ex.No.....) Ex.Rank..... Name .....of ……District hereby declare that I have never been employed in any post in any class or service or category classified under State service or Subordinate service of Tamil Nadu.

4) Knowing the above facts, I (Ex.No.....) Ex.Rank..... Name .....of…….District hereby declare that I have been employed in ..... State service or Subordinate service of Tamil Nadu as .....from.....to.....after my retirement from the Armed Forces. I also enclose herewith the No Objection Certificate obtained from my employer.

5) Further, if the above declaration is found to be false, I may be subjected to any departmental / legal/ penal action as deemed fit and my candidature to the said examination will be cancelled by the Commission after due process.

(*Strikeout whichever is not applicable)

Date :

Place :

Signature :

Name :
Register No. :

Ex. No. :

Rank :

Mobile No. :

1.8.4. Failure to upload the supporting documents, shall result in the rejection of claim after due process.

2. Persons with Benchmark Disability:

2.1. “Person with Benchmark Disability” means a person with not less than forty percent of a specified disability where specified disability has not been defined in measurable terms and includes a person with disability where specified disability has been defined in measurable terms, as certified by the certifying authority designated by the Government under sub-section (1) of section 57 of the Rights of Persons with Disabilities Act, 2016.

2.2. Fee Concession: Full exemption**.**

2.3. Reservation of Appointments: (For posts identified suitable for persons with benchmark disabilities) Out of the total number of appointments to be made in the communal reservation categories, viz., Scheduled Castes / Scheduled Caste - Arunthathiyars (on preferential basis) / Scheduled Tribes / Most Backward Classes / Denotified Communities / Backward Classes (other than Muslim) / Backward Classes (Muslim) and General Turn, in the case of appointment made by direct recruitment, 1% each shall be reserved for persons with benchmark disabilities under categories (a), (b) and (c) and 1% for persons with benchmark disabilities under categories (d) and (e) both taken together, namely:

a. blindness and low vision;
b. deaf and hard of hearing;
c. locomotor disability including cerebral palsy, leprosy cured, dwarfism, acid attack victims and muscular dystrophy;
d. autism, intellectual disability, specific learning disability and mental illness;
e. multiple disabilities from amongst persons under categories (a) to (d) including deaf-blindness in the posts identified for each disability.

2.4. Supporting Documents:

2.4.1. The Persons with Benchmark Disability should produce Disability Certificate at the time of online application in the format shown below, prescribed in the Rights of Persons with Disabilities Rules, 2017 and issued by the competent authority as mentioned below;

Form V
Certificate of Disability
(In cases of amputation or complete permanent paralysis of limbs or dwarfism and in case of blindness)

(Name and Address of the Medical Authority issuing the Certificate)

Recent passport size attested photograph (Showing face only) of the person with disability.

Certificate No. _____ Date:_____

This is to certify that I have carefully examined Shri./ Smt./ Kum._____ Son / wife / daughter of Shri._____Date of Birth (DD/ MM/YY)_____Age _____ years, male / female Registration No. _____ permanent resident of House No. Ward / Village / Street Post Office _____District State , whose photograph is affixed above, and am satisfied that:

(A) he / she is a case of:

- locomotor disability
- dwarfism
- blindness

(Please tick as applicable)

(B) the diagnosis in his / her case is_____

(C) he / she has_____% (in figure)_____percent (in words) permanent locomotor disability/ dwarfism/ blindness in relation to his / her _____ (part of body) as per guidelines (..... number and date of issue of the guidelines to be specified).

2. The applicant has submitted the following document as proof of residence:-

Nature of Document	Date of Issue	Details of authority issuing certificate

(Signature and Seal of Authorized Signature of notified Medical Authority)

Signature/ thumb impression of the person in whose favour certificate of disability is issued.

Form VI
Certificate of Disability
(In cases of multiple disabilities)
(Name and Address of the Medical Authority issuing the Certificate)

Recent passport size attested photograph (Showing face only) of the person with disability.

Certificate No._____ Date._____

This is to certify that we have carefully examined Shri./ Smt./ Kum._____ son/ wife/ daughter of Shri_____Date of Birth (DD/ MM/ YY) _____ Age _____ years, male/ female _____. Registration No. _____ permanent resident of House No. _____ Ward/ Village/ Street _____ Post Office _____ District _____ State _____, whose photograph is affixed above, and am satisfied that:

(A) he/ she is a case of Multiple Disability. His/ her extent of permanent physical impairment/ disability has been evaluated as per guidelines (..... number and date of issue of the guidelines to be specified) for the disabilities ticked below, and is shown against the relevant disability in the table below**:**

Sl. No.	Disability	Affected part of body	Diagnosis	Permanent physical impairment/ mental disability (in%)
1.	Locomotor disability	@		
2.	Muscular Dystrophy			
3.	Leprosy cured			
4.	Dwarfism			
5.	Cerebral Palsy			
6.	Acid attack Victim			
7.	Low vision	#		
8.	Blindness	#		
9.	Deaf	£		
10.	Hard of Hearing	£		
11.	Speech and Language disability			
12.	Intellectual Disability			
13.	Specific Learning Disability			
14.	Autism Spectrum Disorder			
15.	Mental illness			
16.	Chronic Neurological Conditions			
17.	Multiple sclerosis			
18.	Parkinson's disease			
19.	Haemophilia			
20.	Thalassemia			
21.	Sickle Cell disease			

(B) In the light of the above, his/ her over all permanent physical impairment as per guidelines (.....

number and date of issue of the guidelines to be specified), is as follows : -
In figures :- ---------- percent
In words :- ---------- percent

2. This condition is progressive/ non-progressive/ likely to improve/ not likely to improve.

3. Reassessment of disability is:
(i) not necessary, or
(ii) is recommended/ after ..... years ..... months, and therefore this certificate shall be valid till --- --- ---
(DD) (MM) (YY)

@ e.g. Left/ right/ both arms / legs
# e.g. Single eye
£ e.g. Left/ Right/ both ears

4. The applicant has submitted the following document as proof of residence:-

Nature of document	Date of issue	Details of authority issuing certificate

5. Signature and seal of the Medical Authority.

Name and Seal of Member	Name and Seal of Member	Name and Seal of the Chairperson

Signature / thumb impression of the person in whose favour certificate of disability is issued.

Form VII
Certificate of Disability
(In cases other than those mentioned in Forms V and VI)
(Name and Address of the Medical Authority issuing the Certificate)

Recent passport size attested photograph (Showing face only) of the person with disability.

Certificate No._____ Date._____

This is to certify that I have carefully examined Shri./ Smt./ Kum. _____ son / wife / daughter of Shri _____ Date of Birth (DD/ MM/ YY)___ __ ___ Age _____ years, male/ female _____ Registration No. _____ permanent resident of House No. _____ Ward/ Village/ Street _____ Post Office _____ District _____ State _____, whose photograph is affixed above, and am satisfied that he/ she is a case of _____ disability. His/ her extent of percentage physical impairment/ disability has been evaluated as per guidelines (..... number and date of issue of the guidelines to be specified) and is shown against the relevant disability in the table below:-

Sl. No.	Disability	Affected part of body	Diagnosis	Permanent physical impairment/mental disability (in %)
1.	Locomotor disability	@		
2.	Muscular Dystrophy			
3.	Leprosy cured			
4.	Cerebral Palsy			
5.	Acid attack Victim			
6.	Low vision	#		
7.	Deaf	€		
8.	Hard of Hearing	€		
9.	Speech and Language disability			
10.	Intellectual Disability			
11.	Specific Learning Disability			
12.	Autism Spectrum Disorder			
13.	Mental illness			
14.	Chronic Neurological Conditions			
15.	Multiple sclerosis			
16.	Parkinson's disease			
17.	Haemophilia			
18.	Thalassemia			
19.	Sickle Cell disease			

(Please strike out the disabilities which are not applicable)

2. The above condition is progressive / non-progressive / likely to improve / not likely to improve.
3. Reassessment of disability is:
(i) not necessary, or
(ii) is recommended/ after __ years __ months, and therefore this certificate shall be valid till (DD/ MM/ YY) ____ ____ ____

@ - eg. Left/ Right/ both arms/ legs
# - eg. Single eye/ both eyes
€ - eg. Left/ Right/ both ears

4. The applicant has submitted the following document as proof of residence:-

Nature of Document	Date of Issue	Details of authority issuing certificate

(Authorized Signatory of notified Medical Authority)
(Name and Seal)

Countersigned

{Countersignature and seal of the Chief Medical Officer/ Medical Superintendent/ Head of Government Hospital, in case the Certificate is issued by a medical authority who is not a Government servant (with seal)}

Signature/ thumb impression of the person in whose favour certificate of disability is issued.

List of Certifying Authority for the issue of disability certificate

TABLE – I

S. No.	Specified disability	Medical Authority for the purpose of the issue of disability certificate	Certifying authority to issue certificate of disability
1	In case of amputation or complete permanent paralysis of limbs or dwarfism	Hospitals/ Institutions/ Primary Health Centres run by Central and State Government/ Statutory Local bodies	Any doctor/ medical practitioner working in the Hospitals/ Institutions/ Primary Health Centres run by Government/ Statutory Local bodies.
2	Multiple Disability	District Hospital/ Other hospitals/ Institutions run by Central and State Government /Statutory Local Bodies having relevant medical specialist and testing/assessment facilities	Medical Board consisting of three members of whom two will be specialist dealing with relevant disabilities
3	Specified Disabilities not mentioned in Serial numbers 1 & 2 above	Hospitals / Primary Health Centers / Institutions run by Central and State Government/ Statutory Local bodies having relevant medical specialist and testing / assessment facilities	A specialist dealing with the relevant disability as specified in the Table - II given below

TABLE – II

Sl. No.	Category	Specialist
1	Locomotor disability other than amputation or complete permanent paralysis of limbs and dwarfism	Specialist in Physical Medicine and Rehabilitation or Orthopaedician.
2	Muscular Dystrophy	Specialist in Physical Medicine and Rehabilitation or Orthopaedician.
3	Leprosy cured person	Specialist in Physical Medicine and Rehabilitation or Orthopaedician.
4	Cerebral Palsy	Specialist in Physical Medicine and Rehabilitation or Orthopaedician.
5	Acid Attack Victim	Specialist in Physical Medicine and Rehabilitation or Orthopaedician.
6	Blindness	Specialist in the field of Ophthalmology.
7	Low Vision	Specialist in the field of Ophthalmology.
8	Deaf	Specialist in the field of Ear, Nose, Throat (E.N.T).
9	Hard of Hearing	Specialist in the field of Ear, Nose, Throat (E.N.T).
10	Speech and Language Disabilities	Specialist in the field of Ear, Nose, Throat (E.N.T) and Neurologist.
11	Intellectual Disability	Adults with intellectual disability above the age group of 18 years – Psychiatrist.
12	Specific Learning Disabilities	Medical board consisting of a) Paediatrician; and b) Psychiatrist and Trained Psychologist.

13	Autism spectrum disorder	Medical Board consisting of a) Psychiatrist and Trained psychologist; and b) Paediatrician or General Physician.
14	Mental Illness	Psychiatrist.
15	Chronic Neurological Conditions such as Multiple Sclerosis and Parkinson's Disease	Medical Board consisting of a) Psychiatrist and Trained Psychologist; and b) Neurologist; and c) Orthopaedician or Specialist in Physical Medicine and Rehabilitation.

2.4.2. In case the certificate is issued by a medical authority who is not a Government servant, it shall be valid only if countersigned by the Joint Director, Medical Services.

2.4.3. The disability claimed in the online application, shall be exactly the same as stated in the Disability Certificate. Any discrepancy in this regard shall result in rejection of claim after due process.

2.4.4. Claim as person with benchmark disability, unsupported by the prescribed documents shall result in rejection of claim after due process.

3. Destitute Widow:

3.1. "Destitute Widow" means a widow whose total monthly income from all sources shall not be more than Rs.4,000/-(Rupees Four Thousand only), including any family pension or other receipts including income from private practice in the case of professionals. Destitute Widow shall not include a divorcee or a woman deserted by her husband. The status of an individual as Destitute Widow is with reference to the date of notification.

3.2. Fee Concession: Full exemption.

3.3. Reservation of Appointments: The rule of reservation of appointment to Destitute Widow candidates will apply for this recruitment. 10% of vacancies out of 30% of vacancies set apart for Women candidates in direct recruitment are reserved for Destitute Widows. The reservation of appointment to Destitute Widow is applicable only for the post which does not exceed Level-10 in the pay matrix in this notification. If no qualified and suitable destitute widow is available, then, the turn so set apart for destitute widow shall go to the women / Transgender (Women) (other than destitute widow) belonging to the respective category.

3.4. Supporting Documents:

3.4.1. The Destitute Widows should upload a certificate from the Revenue Divisional Officer or the Assistant Collector or the Sub-Collector concerned, in the format prescribed below. Failure to upload such certificate or uploading of a widow or divorcee certificate, at the time of submission of online application, shall result in rejection of claim after due process.

Form of Destitute Widow Certificate

1. Name of the individual
2. Full Postal Address
3. Details of job held, if any:
4. Particulars of her children, if any
5. Name and last occupation of her late husband
6. Date of demise of her husband
7. Monetary benefits received after her husband‘s death by way of family pension, insurance, etc., if any
8. Details of Properties if any immovable and movable left behind by him
9. Present monthly income
   a. From salaries/wages
   b. From family pension
   c. From private properties
   d. Rents received
   e. From private practice
   f. Other sources, if any
   g. Total

10. Whether living alone or living with her husband‘s parents / in-laws / parents / brother(s)
11. Whether she satisfies the definition of the term “Destitute Widow” as defined in section 20(8) and 26 of Tamil Nadu Government Servants (Conditions of Service) Act, 2016.

Certified that I have verified the particulars furnished by the individual and satisfied myself as to the correctness of her claim with reference to the definition of the term – “Destitute Widow” in section 20(8) and 26 of Tamil Nadu Government Servants (Conditions of Service) Act, 2016.

Certificate Reference No.:	Signature:
Place:	Name:
Date:	Designation:

Revenue Divisional Officer / Assistant Collector / Sub-Collector

Explanation - The above certificate should be issued only by the Revenue Divisional Officer or the Assistant Collector or the Sub-Collector concerned.

3.4.2. A ‘Widow Certificate’ is different from a ‘Destitute Widow Certificate’. Candidates who have uploaded Widow Certificates will not be considered as Destitute Widow.

3.4.3. Claim as Destitute Widow shall be admitted only if the date of demise of husband is on or before the date of notification.

3.4.4. Any correction in the Destitute Widow certificate must be attested by the issuing authority or a fresh certificate in lieu thereof must be uploaded.

4. Person Studied in Tamil Medium (PSTM):

4.1. “Person Studied in Tamil medium” means a person who has studied through Tamil medium of instruction up to the educational qualification prescribed for direct recruitment in the rules or regulations or orders applicable to any appointment in the services under the State.

4.1.1. In cases where a Degree is prescribed as the educational qualification, one shall have studied from first standard to Degree through Tamil medium of instruction.

4.1.2. The candidates who did not join school in the 1 st standard, but joined schools directly in 2 nd standard to 8th standard, studied with Tamil as the medium of instruction and passed, and those who studied with Tamil as the medium of instruction in other states and then continued their education in Tamil Nadu from the standard they entered are also eligible.

4.1.3. Students who have studied in Tamil medium in regular stream in 10th, 11th and 12th standard and failed to pass one or more subjects in them, but have later passed in the subject as private students and have continued to study in schools and colleges in Tamil medium and have passed are eligible to be considered under PSTM category.

4.1.4. The candidates who have passed the examination through Tamil medium directly as private candidates without going to school are not eligible to be considered under PSTM category.

4.2. Supporting Documents:

4.2.1. Candidates claiming to be Persons Studied in Tamil Medium (PSTM) must upload evidence for the same, in the form of SSLC, HSC, Transfer Certificate, Provisional Certificate, Convocation Certificate, Degree Certificate, PG Degree Certificate, Mark Sheets, Certificate from the Board or University or from the Institution, as the case may be, with a recording that he had studied the entire duration of the respective course(s) through Tamil medium of instruction.

4.2.2. The candidates should obtain certificates of education in Tamil medium from all the relevant educational institutions where they studied upto the prescribed educational qualification. Candidates must upload documents as evidence of having studied in the Tamil medium, all educational qualifications from 1st standard up to the educational qualification prescribed.

4.2.3. If no such document as evidence for 'Person Studied in Tamil Medium' is available, a certificate from the Principal / Head Master / District Educational Officer / Chief Educational Officer / Director , Directorate of Government Examinations / Competent Authority, Principal / Registrar of Industrial Training Institute / College / University as the case may be, in the format as shown below, must be uploaded for each and every educational qualification, from 1st standard upto the educational qualification prescribed.

4.2.4. Failure to upload such documents as evidence for 'Persons Studied in Tamil Medium' for all educational qualification up to the educational qualification prescribed, shall result in the rejection of claim after due process.

4.2.5. Documents uploaded as proof of having studied in Tamil medium, for the partial duration of any course, shall not be accepted and shall result in the rejection of claim after due process.

Certificate for having studied in Tamil Medium*

This is to certify that Thiru./Tmt./Selvi. ……(Name) had studied Classes …….. to …… with Tamil as the medium of instruction, in this school / through Private Studies during the year ……. to ..... and had satisfactorily completed the course of studies prescribed for Classes ……. to ……..

Thiru./Tmt./Selvi. ……(Name) was / was not awarded scholarship meant for students studying in the Tamil medium.

This certificate is issued with reference to Section 2(d) of the PSTM (Amendment) Act, 2020, based on the verifiable documentary evidence. The undersigned assumes full responsibility for the veracity of the contents herein.

Signature of Principal / Head Master /
District Educational Officer /
Chief Educational Officer /
Director, Directorate of Govt. Exams /
Competent Authority

Place:
Date: Seal of the Institution (Mobile No. _____)

* If the candidate has studied in different schools from 1st std. up to 10th std./ 12th std., then the above certificate shall be obtained from each of the schools the candidate has studied in.

Certificate for having studied in Tamil Medium*

This is to certify that Thiru / Tmt. / Selvi. ……(Name) had studied…..……. (Diploma / Degree / PG Degree, etc.) during the year ……. to ……. with Tamil as the medium of instruction and had satisfactorily completed the course of studies prescribed for.....(Diploma / Degree / PG Degree, etc.).

Thiru / Tmt. / Selvi. ……(Name) was / was not awarded scholarship meant for students studying in the Tamil medium.

This certificate is issued with reference to Section 2(d) of the PSTM (Amendment) Act, 2020, based on the verifiable documentary evidence. The undersigned assumes full responsibility for the veracity of the contents herein.

Signature of Principal /
Registrar Industrial Training Institute /
College / University

Place:

Date: Seal of the Institution (Mobile No._____)

* If the candidate has completed different courses in different Institutions, such a certificate shall be obtained from each of these Institutions for the courses completed therein.

5. Scheduled Castes, Scheduled Caste (Arunthathiyars) and Scheduled Tribes:

5.1. “Scheduled Castes” means the communities given in the Annexure to the “Instructions to Applicants” [extracted from Part-A of Schedule-II of the Tamil Nadu Government Servants (Conditions of Service) Act, 2016].

5.2. ‘Arunthathiyar’ means the castes: Arunthathiyar, Chakkiliyan, Madari, Madiga, Pagadai, Thoti and Adi Andhra.

5.3. “Scheduled Tribes” means the communities given in the Annexure to the “Instructions to Applicants” [extracted from Part-B of Schedule-II of Tamil Nadu Government Servants (Conditions of Service) Act, 2016.

Note: Persons belonging to Tamil Nadu and to any one of the communities mentioned in the lists shown in the Annexure to the “Instructions to Applicants” alone shall be treated as Scheduled Castes or Scheduled Tribes as the case may be. Persons belonging to other States shall not be treated as belonging to the Scheduled Castes or Scheduled Tribes even though they may belong to any one of the communities specified in the list.

5.4. Fee Concession: Full exemption

5.5. Reservation of Appointments: The selection will be made following the rule of reservation of appointments for Scheduled Castes / Scheduled Caste (Arunthathiyars) / Scheduled Tribes.

Scheduled Caste (SC)	15%
Scheduled Caste (Arunthathiyar) (SCA)	3%
Scheduled Tribe (ST)	1%

5.6. Supporting Documents:

5.6.1. The Scheduled Caste (Arunthathiyars) and Scheduled Castes candidates should produce the Community certificate, citing either father‘s / mother‘s name, issued by Taluk Tahsildar, in whose jurisdiction the candidate claims to have permanent residence.

5.6.2. The Scheduled Tribe candidates should produce the Community certificate, citing either father‘s / mother‘s name, issued by the Revenue Divisional Officer / Assistant Collector / Sub-Collector / Personal Assistant (General) to the Collector of Chennai / District Adi-Dravidar Welfare Officer, in whose jurisdiction the candidate claims to have permanent residence.

5.6.3. Candidates belonging to Scheduled Tribe communities must upload the report of the State Level Scrutiny Committee (SLSC), if available. Failure to do so would render their claim liable to verification by the State Level Scrutiny Committee.

5.6.4. Uploading of a community certificate citing name of the spouse, shall result in rejection of candidature after due process.

5.6.5. The certificate obtained by the candidates in the form other than the one referred to in G.O. Ms. No.781, Revenue Department, dated 2nd May 1988 and solely based on the entries in SSLC or Transfer Certificate or other school / college records will not be accepted.

5.6.6. Candidates are warned that if the community recorded in the certificate produced by them from the competent authority is not included in the list of Scheduled Castes, Scheduled Caste (Arunthathiyars), Scheduled Tribes, given in the Annexure to the “Instructions to Applicants” [extracted from the Tamil Nadu Government Servants (Conditions of Service) Act, 2016], they will not be permitted to claim to belong to Scheduled Castes, Scheduled Caste (Arunthathiyars), Scheduled Tribes, as the case may be. They will, in that case, be permitted to claim to belong to ‘Others‘ category only.

5.6.7. Candidates belonging to Scheduled Castes, on conversion to religions other than Christianity / Islam, shall be treated as 'Others'. However, Scheduled Caste converts to Sikhism and Buddhism shall be treated as Scheduled Castes.

5.6.8. Failure to upload the supporting documents, when called for shall result in the rejection of claim after due process.

6. Backward Classes:

6.1. "Backward Classes" means the communities specified as Backward Classes, Backward Class Muslims, Most Backward Classes / Denotified Communities given in the Annexure to the "Instructions to Applicants" [extracted from Parts A, B, C and D respectively, of Schedule-I of the Tamil Nadu Government Servants (Conditions of Service) Act, 2016].

6.2. Explanation - Persons who belong to the State of Tamil Nadu alone, who belong to one of the communities specified in Schedule-I, of the Tamil Nadu Government Servants (Conditions of Service) Act, 2016 shall be treated as persons who belong to one of such communities.

6.3. Fee Concession: Three Free Chances

6.4. Reservation of Appointments: The selection will be made following the rule of reservation of appointments for Backward Classes (Muslim), Backward Classes, Most Backward Classes and Denotified Communities.

Backward Class (BC)	26.5%
Backward Class (Muslim) [BC (M)]	3.5%
Most Backward Class / Denotified Communities (MBC / DC)	20.0%

6.5. Supporting Documents:

6.5.1. The candidates belonging to Backward Classes (Muslim), Backward Classes, Most Backward Classes and Denotified Communities should produce the Community certificate, citing either father's / mother's name, issued by Revenue Officer not lower in rank than a Tahsildar or Head Quarters Deputy Tahsildar or Special Deputy Tahsildar appointed to issue Community Certificate or Deputy Tahsildar (School Certificates) or Executive Deputy Tahsildar (in respect of Chennai district) or Additional Head Quarters Deputy Tahsildar or Zonal Deputy Tahsildar, in whose jurisdiction the candidate claims to have permanent residence.

6.5.2. The candidates belonging to Thottia Naicker (including Rajakambalam, Gollavar, Sillavar, Thockalavar, Thozhuva Naicker, and Erragollar) included in the list of MBC / DC should produce the Community certificate, citing either father's / mother's name, issued by Head Quarters Deputy Tahsildar/ Zonal Deputy Tahsildar, in whose jurisdiction the candidate claims to have permanent residence.

6.5.3. Uploading of a community certificate citing name of the spouse, shall result in rejection of claim after due process.

6.5.4. The certificate obtained by the candidates in the form other than the one referred to in G.O. Ms. No.781, Revenue Department, dated 2nd May 1988 and solely based on the entries in SSLC or Transfer Certificate or other school / college records will not be accepted.

6.5.5. Candidates are warned that if the community recorded in the certificate produced by them from the competent authority is not included in the list of Backward Classes (Muslim), Backward Classes, Most Backward Classes / Denotified Communities, given in the Annexure to "Instructions to Applicants" [extracted from the Tamil Nadu Government Servants (Conditions of Service) Act, 2016], they will not be permitted to claim to belong to Most Backward Classes / Denotified Communities, Backward Classes (other than Muslim) or Backward Classes (Muslim), as the case may be. They will, in that case, be permitted to claim to belong to 'Others' category only.

6.5.6. Candidates belonging to Backward Classes, Most Backward Classes / Denotified Communities on conversion to religions other than Christianity / Islam, shall be treated as 'Others'.

6.5.7. Failure to upload the supporting documents, when called for shall result in the rejection of claim after due process.

7. Women:

7.1. Reservation of Appointments: A minimum of 30% of all vacancies shall be set apart for women candidates, irrespective of the fact of whether the rule of reservation of appointments applies to the posts or not. In respect of the posts to which the rule of reservation of appointments applies, 30% of vacancies shall be set apart for women candidates, following the reservation for each communal category as well as open category. Women / Transgender (women) candidates shall be entitled to compete for the said 30% of vacancies. They shall also be entitled to compete for the remaining 70% of vacancies along with male / Transgender / Transgender (men) candidates.

7.2. Supporting Documents: Gender claimed shall be verified against the Transfer Certificate / Community Certificate. Failure to upload the supporting documents at the time of submission of online application shall result in the rejection of claim after due process.

8. Transgender:

8.1. Supporting Documents:

8.1.1. Transgender / Transgender (Male) / Transgender (Female) candidates should produce the Transgender ID card issued only by the Tamil Nadu Transgender Welfare Board.

8.1.2. Uploading of Transgender ID card, issued by any authority other than the Tamil Nadu Transgender Welfare Board shall result in rejection of candidature after due process.

8.1.3. Transgender or Transgender (Male) or Transgender (Female) claim made in the online application must correspond to what is stated in the Transgender ID card. Any discrepancy in this regard shall result in rejection of candidature after due process.

8.1.4. Gender claim unsupported by the requisite documents shall result in rejection of claim after due process.

8.2. Community:

8.2.1. Transgender candidates, who do not possess any community certificate may choose to be considered under 'Others' or under Most Backward Classes.

8.2.2. Transgender candidates who belong to Scheduled Caste / Scheduled Caste (Arunthathiyar) / Scheduled Tribe communities and possess community certificate as such, shall be considered as per their respective community.

8.2.3. Transgender candidates who belong to communities other than Scheduled Caste / Scheduled Caste (Arunthathiyar) / Scheduled Tribe and possess community certificate as such, are permitted to choose to be considered as belonging to their own community or as Most Backward Class, whichever is advantageous to them, at the time of One Time Registration itself. Once the individual opts to be considered as a particular community, it shall be crystallized and this option shall not be changed in the future.

8.2.4. Transgender candidates who do not possess a community certificate and have chosen to be considered under ‘Most Backward Classes‘ or ‘Others‘ and those in possession of a community certificate as Backward Classes / Backward Classes (Muslim) / Denotified Communities but have chosen to be considered under ‘Most Backward Classes‘, need not upload a community certificate in support of their claim.

8.2.5. Transgender candidates, in possession of a community certificate and who have chosen to be considered under the communal reservation category as stated in the community certificate, must upload the same. Failure to upload such a certificate shall result in rejection of claim after due process.

8.2.6. All concessions permitted to Transgender candidates in the matter of choice of communal reservation category, shall be wholly dependent on the uploading of a Transgender ID card issued by the Tamil Nadu Transgender Welfare Board. Failure to upload the same or uploading of a Transgender ID card issued by other authorities, shall result in rejection of claim after due process.

Annexure III

Syllabus

Paper I

Tamil Eligibility Test, General Studies and Aptitude and Mental Ability

Part A - தமிழ் மொழி தகுதித் தேர்வு
(பத்தாம் வகுப்பு தரம் – 100 கேள்விகள்)

குறியீடு: 501

அலகு I: இலக்கணம் (25 கேள்விகள்)

எழுத்து: பிரித்து எழுதுதல் – சேர்த்து எழுதுதல் – சந்திப்பிழை – குறில், நெடில் வேறுபாடு – லகர, ளகர, ழகர வேறுபாடு – னகர, ணகர வேறுபாடு – ரகர, றகர வேறுபாடு – இனவெழுத்துகள் அறிதல் – சுட்டு எழுத்துகள் – வினா எழுத்துகள் – ஒருமைப் பன்மை அறிதல்.

சொல்: வேர்ச்சொல் அறிதல் – வேர்ச்சொல்லில் இருந்து வினைமுற்று, வினையெச்சம், வினையாலணையும் பெயர், பெயரெச்சம் வகை அறிதல் – அயற்சொல் – தமிழ்ச்சொல், எதிர்ச்சொல் – வினைச்சொல் – எழுத்துப் பிழை, ஒற்றுப்பிழை அறிதல் – இரண்டு வினைச் சொற்களின் வேறுபாடு அறிதல்.

அலகு II: சொல்லகராதி (15 கேள்விகள்)

(i) எதிர்ச்சொல்லை எடுத்தெழுதுதல், ஓரெழுத்து ஒரு மொழி, உரிய பொருளைக் கண்டறிதல் – ஒருபொருள் தரும் பல சொற்கள், பொருந்தா சொல்லைக் கண்டறிதல், அகர வரிசைப்படி சொற்களைச் சீர்செய்தல்; ஒருபொருள் பன்மொழி – இருபொருள் குறிக்கும் சொற்கள் – பேச்சு வழக்கு, எழுத்து வழக்கு – சொல்லும் பொருளும் அறிதல் – ஒரு சொல்லிற்கு இணையான வேறு சொல் அறிதல்.

(ii) கோடிட்ட இடத்தில் சரியான சொல்லைத் தேர்ந்தெடுத்து எழுதுதல் - (எ.கா.) பள்ளிக்குச் சென்று கல்வி பயிலுதல் சிறப்பு (பயிலுதல், எழுதுதல்) - வானில் முகில் தோன்றினால் மழை பொழியும் (முகில், நட்சத்திரம்); பொருத்தமான பொருளைத் தெரிவு செய்தல் - (எ.கா.) ஊடகம் - தகவல் தொடர்புச் சாதனம் (செய்தி, தகவல் தொடர்புச் சாதனம்) - சமூகம் – மக்கள் குழு (மக்கள் குழு, கூட்டம்); ஊர்ப் பெயர்களின் மரூஉவை எழுதுக - (எ.கா.) புதுச்சேரி – புதுவை, மன்னார்குடி – மன்னை, மயிலாப்பூர் – மயிலை; பிழை திருத்துக. (எ.கா.) ஒரு – ஓர்; பேச்சு வழக்குச் சொற்களுக்கு இணையான தூய தமிழ்ச் சொற்களை இணைத்தல் - (எ.கா.) வெத்தில – வெற்றிலை, நாக்காலி – நாற்காலி;

(iii) பேச்சு வழக்குத் தொடர்களிலுள்ள பிழை திருத்தம் - (எ.கா.) நேத்து மழ பேஞ்சுது - நேற்று மழை பெய்தது; சொற்களை இணைத்துப் புதிய சொல் உருவாக்குதல்: மற்றும், அல்லது, ஆல், பிறகு, வரை, இதுவுமல்ல, இருப்பினும், எனினும், இதனால்; அடைப்புக்குள் உள்ள சொல்லைத் தகுந்த இடத்தில் சேர்த்தல் - (எனவே, ஏனெனில், ஆகையால், அதுபோல, அதனால், வரை, பின்பு) - (எ.கா.) நான் காட்டிற்குச் சென்றேன். அதனால் புலியைப் பார்த்தேன் - மாலைநேரம் முடியும் வரை விளையாடுவேன். தேர்வு முடிந்த பின்பு சுற்றுலா செல்லலாம்; பொருள் தரும் ஓர் எழுத்து - (எ.கா.) ஆ-பசு, ஈ-கொடு, தை-மாதம், தீ – நெருப்பு; பல பொருள் தரும் ஒரு சொல்லைக் கூறுக - (எ.கா.) கமலம், கஞ்சம், முளரி, பங்கயம் இச்சொற்கள் தாமரையைக் குறிக்கும்.

அலகு III: எழுதும் திறன் (15 கேள்விகள்)

(i) சொற்களை ஒழுங்குபடுத்திச் சொற்றொடர் அமைத்தல் – தொடர் வகைகள் – செய்வினை, செயப்பாட்டு வினை – தன்வினை, பிறவினை – ஒருமைப் பன்மை பிழையறிந்து சரியான தொடரறிதல்.

(ii) மரபுத் தமிழ்: திணை மரபு - உயர்திணை: அம்மா வந்தது – அம்மா வந்தாள்; அஃறிணை: மாடுகள் நனைந்தது – மாடுகள் நனைந்தன; பால் மரபு: ஆண்பால்: அவன் வந்தது – அவன் வந்தான்; பெண்பால்: அவள் வந்தது – அவள் வந்தாள்; பலர் பால்: அவர்கள் வந்தார்கள் – அவர்கள் வந்தனர்; ஒன்றன் பால்: அது வந்தன - அது வந்தது; பலவின் பால்: பறவைகள் பறந்தனர் – பறவைகள் பறந்தன; காலம்: நேற்று மழை பெய்யும் – நேற்று மழை பெய்தது; நேற்று வருவேன் – நேற்று வந்தேன்; இளமைப் பெயர்: பசு – கன்று; ஆடு – குட்டி; ஒலிமரபு: நாய் கத்தியது – நாய் குரைத்தது; வினைமரபு: கூடைமுடை, சோறு உண்; தொகை மரபு: மக்கள் கூட்டம் – ஆட்டு மந்தை; நிறுத்தல் குறியீடுகள்: கால்புள்ளி, அரைப் புள்ளி, முக்கால் புள்ளி, முற்றுப் புள்ளி, வியப்புக் குறி, வினாக்குறி அமையும் இடங்கள்.

அலகு IV: கலைச் சொற்கள் (10 கேள்விகள்)

பல்துறை சார்ந்த கலைச் சொற்களை அதாவது அறிவியல், கல்வி, மருத்துவம், மேலாண்மை, சட்டம், புவியியல், தொழில்நுட்பம், ஊடகம், தகவல் தொழில்நுட்பம் உள்ளிட்ட பல்துறை சார்ந்த கலைச் சொல்லுக்கு நேரான தமிழ்ச் சொற்களை அறிந்திருக்க வேண்டும். (உதாரணம்: search engine – தேடு பொறி, வலசை – Migration, ஒவ்வாமை – Allergy, மரபணு – Gene, கடல் மைல் – Nautical Mile)

அலகு V: வாசித்தல் – புரிந்து கொள்ளும் திறன் (15 கேள்விகள்)

கொடுக்கப்பட்ட பத்தியிலிருந்து கேட்கப்பட்ட வினாக்களுக்கு சரியான விடையைத் தேர்ந்தெடுத்தல் - செய்தித்தாள் – தலையங்கம் – முகப்புச் செய்திகள் – அரசு சார்ந்த செய்திகள் –கட்டுரைகள் – இவற்றை வாசித்தல் - புரிந்து கொள்ளும் திறன் – உவமைத் தொடரின் பொருளறிதல் - மரபுத் தொடரின் பொருளறிதல் – பழமொழிகள் பொருளறிதல் – ஆவண உள்ளடக்கங்களைப் புரிந்து கொள்ளும் திறன்.

அலகு VI: எளிய மொழி பெயர்ப்பு (5 கேள்விகள்)

ஆங்கிலம் மற்றும் பிறமொழிச் சொற்களுக்கு இணையான தமிழ்ச் சொற்கள் அறிதல் வேண்டும் – பயன்பாட்டில் உள்ள ஆங்கிலச் சொற்களை மொழிபெயர்த்தல் வேண்டும் (சான்று: pendrive, printer, computer, keyboard) – ஆவணங்களின் தலைப்பு – கோப்புகள் – கடிதங்கள் – மனுக்கள் – மொழிபெயர்ப்பு புரிந்து கொள்ளுதல்.

அலகு VII: இலக்கியம், தமிழ் அறிஞர்களும், தமிழ்த்தொண்டும் (15 கேள்விகள்)

திருக்குறள் தொடர்பான செய்திகள் (இருபது அதிகாரங்கள் மட்டும்) ஒழுக்கமுடைமை, பொறையுடைமை, ஊக்கமுடைமை, விருந்தோம்பல், அறன் வலியுறுத்தல், ஈகை, பெரியாரைத் துணைக்கோடல், வினை செயல்வகை, அவையஞ்சாமை, கண்ணோட்டம், அன்புடைமை, கல்வி, நடுநிலைமை, கூடா ஒழுக்கம், கல்லாமை, செங்கோன்மை, பண்புடைமை, நட்பாராய்தல், புறங்கூறாமை, அருளுடைமை - மேற்கோள்கள் -

அறநூல் தொடர்பான செய்திகள் (நாலடியார், நான்மணிக்கடிகை, பழமொழி நானூறு, முதுமொழிக்காஞ்சி, திரிகடுகம், இன்னாநாற்பது, சிறுபஞ்சமூலம், ஏலாதி, அவ்வையார் பாடல்கள்) - தமிழின் தொன்மை, சிறப்பு, திராவிட மொழிகள் தொடர்பான செய்திகள் - உ.வே.சாமிநாத ஐயர், தெ.பொ.மீனாட்சி சுந்தரம், சி.இலக்குவனார் தமிழ்ப்பணி தொடர்பான செய்திகள் - தேவநேய பாவாணர், அகரமுதலி, பாவலரேறு பெருஞ்சித்திரனார், ஜி.யு.போப், வீரமாமுனிவர் தமிழ்த் தொண்டு தொடர்பான செய்திகள் – தமிழ்ச் சான்றோர் பற்றிய செய்திகள்: பாவேந்தர், டி.கே.சிதம்பரனாதர், தவத்திரு குன்றக்குடி அடிகளார், கண்ணதாசன், காயிதே மில்லத், தாரா பாரதி, வேலுநாச்சியார், பட்டுக்கோட்டைக் கல்யாணசுந்தரம், முடியரசன், தமிழ் ஒளி, உருத்திரங்கண்ணனார், கி.வா.ஜகந்நாதர், நாமக்கல் கவிஞர்.

குறிப்பு: அலகு VII-க்கான பாடத்திட்டம் பத்தாம் வகுப்பு வரையிலான (upto SSLC Standard) பாடப் புத்தகங்களை அடிப்படையாகக் கொண்டது.

Part B: General Studies (SSLC Standard – 75 Questions)

Unit I: General Science (5 Questions)

Nature of Universe - Measurement of physical quantities - General scientific laws in motion - force, pressure, and energy - Everyday application of the basic principles of mechanics, electricity, magnetism, light, sound, heat, and nuclear physics in our daily life; Elements and compounds, acids, bases, salts, petroleum products, fertilizers, pesticides, metallurgy, and food adulterants; main concepts of life science, classification of living organisms, evolution, genetics, physiology, nutrition, health and hygiene, human diseases; Environmental science; Latest inventions in science and technology; Current affairs.

Unit II: Geography (5 Questions)

Earth location - Physical features - Monsoon, rainfall, weather, and climate - Water resources - Rivers - Soil, Minerals, and Natural resources - Forest and Wildlife - Agriculture pattern; Transport - Communication; Population density and distribution in Tamil Nadu and India; Calamities - Disaster management - Environment - Climate change; Geographical landmarks; Current affairs.

Unit III: History, Culture of India, and Indian National Movement (10 Questions)

Indus Valley Civilization - Guptas, Delhi Sultans, Mughals, and Marathas – South Indian History; National Renaissance - Early uprising against British Rule - Indian National Congress - Emergence of Leaders - B.R.Ambedkar, Bhagat Singh, Bharathiar, V.O.Chidambaranar, Thanthai Periyar, Jawaharlal Nehru, Rabindranath Tagore, Kamarajar, Mahatma Gandhi, Maulana Abul Kalam Azad, Rajaji, Subhash Chandra Bose, Muthulaksmi Ammaiyar, Muvalur Ramamirtham, and other National Leaders; Different modes of agitation of Tamil Nadu and movements; Characteristics of Indian Culture, Unity in Diversity - Race, Language, Custom; India as a secular state.

Unit IV: Indian Polity (15 Questions)

Constitution of India - Preamble to the Constitution – Salient features of the Constitution - Union, State, and Union Territory; Citizenship, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy; Union Executive, Union Legislature – State Executive, State Legislature - Local Governments, Panchayat Raj; Spirit of federalism: Centre - State relationships; Election - Judiciary in India - Rule of Law;

Corruption in public life - Anti-Corruption measures - Lokpal and Lokayukta – Right to Information - Empowerment of Women - Consumer Protection Forums - Human Rights Charter; Political parties and political system in Tamil Nadu and India; Current affairs.

Unit V: Indian Economy and Development Administration in Tamil Nadu (20 Questions)

Nature of Indian economy - Five-year plan models - an assessment - Planning Commission and Niti Aayog; Sources of revenue - Reserve Bank of India - Finance Commission - Resource sharing between Union and State Governments - Goods and Services Tax; Economic trends - Employment generation, Land reforms and Agriculture - Application of Science and Technology in Agriculture; Industrial growth - Rural Welfare oriented programmes - Social problems – Population, Education, Health, Employment, Poverty; Social Justice and Social Harmony as the cornerstones of socio-economic development; Education and Health systems in Tamil Nadu; Geography of Tamil Nadu and its impact on economic growth; Welfare schemes of Government; Current socio-economic issues; Current affairs.

Unit VI: History, Culture, Heritage, and Socio-Political Movements of Tamil Nadu (20 Questions)

History of Tamil Society, related archaeological discoveries - Tamil Literature from Sangam age till contemporary times; Thirukkural - Significance as a Secular Literature - Relevance to everyday life - Impact of Thirukkural on Humanity - Thirukkural and Universal Values – Relevance to Socio-politico-economic affairs - Philosophical content in Thirukkural; Role of Tamil Nadu in freedom struggle - Early agitations against British Rule - Role of women in freedom struggle; Various Social reformers, Social reform movements and Social transformation of Tamil Nadu.

Part C: Aptitude and Mental Ability (SSLC Standard – 25 Questions)

Unit I: Aptitude (15 Questions)

Simplification - Percentage - Highest Common Factor (HCF) - Lowest Common Multiple (LCM) - Ratio and Proportion - Simple interest - Compound interest - Area - Volume - Time and Work.

Unit II: Reasoning (10 Questions)

Logical reasoning - Puzzles - Dice - Visual reasoning - Alpha numeric reasoning - Number series.

Paper II – Subject Paper

1. Agriculture

(Diploma Standard)

Code: 431

Unit I: Agronomic Principles, Practices and Meteorology (30 Questions)

Agriculture – Definition – Branches of agriculture – Classification and status of major crops in Tamil Nadu. Factors affecting crop production. Cropping systems definitions - principles - intercropping - types, Principles and Practices of Agricultural Operations – Tillage definition and types - Intercultural Operations, Implements and Tools in Agriculture – Growth stages and yield prediction.

Meteorology – Agricultural Meteorology – Definition - Importance in Crop Production - Atmosphere – Components and its importance – Weather Parameters and their role in Crop Production. Rainfall – Spatial and Temporal Variability in Tamil Nadu across Seasons – Agro Climatic Zones of Tamil Nadu. Automatic weather stations and its components - Agroadvisory services.

Irrigation - water movement in soil – soil moisture constants – available soil moisture - effect of water stress on crop yield – water use efficiency – water requirement of major crops – critical stages of water requirement – irrigation scheduling – types and advantages – Irrigation methods – Micro irrigation – Flagship schemes and policies of Tamil Nadu - Irrigation water use efficiency – management of poor quality irrigation water - soil erosion due to water and control.

Weeds – definition and importance of weed control in crop production – classification of weeds – methods of weed management. Herbicide classification based on mode of action - method of application - common and new herbicides available in the market – weed control practices for major crops – parasitic, problematic and aquatic weed management - integrated weed management – concepts and practices.

Agronomic practices including climatic and soil requirement, land preparation – seeds and sowing – varieties – fertilizer management – irrigation – weed control – harvesting – Production technologies for cereals, millets, pulses, oilseeds, commercial crops, mulberry, forages and green manure crops.

Unit II: Farming system, Dry Farming and Agro-Forestry (10 Questions)

Integrated farming system – models and components – Schemes of Tamil Nadu. Cropping schemes – Crop calendar of operation of major crops - Dry Farming – Definition and Present Status in Tamil Nadu – Soils of Dry Farming Tracts and their limitation to Crop Production – Major Crops of Dry Land. Suitable Dry Land Technology for increased Crop Productivity – Pre-monsoon sowing – Conventional Crop Production Vs Alternate land Use in Dry Land – Drought and disaster effects and management – crop insurance schemes - Integrated Farming Systems in drylands. Erosion - Classification of Erosion – Soil moisture conservation practices – agronomical, physical and biological methods - Cultivation Practices – Water Harvest – Farm Ponds – Percolation Ponds –Weather aberrations and Contingent Crop Planning – Watershed development – definition and components. Land use classification – Role of Forests – Agroforestry – Definition and types – Social Forestry, Urban Forestry – Agroforestry Systems - Shifting Cultivation – Alley cropping – Wind Break and Shelter Belts – Agroforestry Practices – Teak, Casuarina, Ailanthus, Neem, Bamboo, and Acacia production and management practices.

Unit III: Soils and Fertility Management (30 Questions)

Definition of Soil – Its main components – Soils of Tamil Nadu. Soil physical, chemical and biological properties and their significance in crop production. Soil Micro Organisms - Importance of Organic Matter on Soil Properties. Acid, Saline and Alkaline Soils and their reclamation. Soil and water pollutants and management. Irrigation water – Qualities of irrigation water - Water testing. Soil Fertility – Major, Secondary and Minor Plant Nutrients. Soil Fertility evaluation, Soil sampling and testing and fertilizer recommendations – Soil health card. Fertilizers – Nitrogenous, Phosphatic and Potassic Fertilizers –

Complex and Mixed Fertilizers, Efficient use of Fertilizers – fertilizer management in major crops. Identification and management of major and minor nutrient deficiency symptoms in plants. Biostimulants – New age fertilizers – Crop Boosters - Remote sensing – GIS and GPS. Bio-Fertilizers – Groups of Bio-Fertilizers – Bacterial, Fungal, Algae and Azolla.

Unit IV: Horticultural Crop Cultivation Techniques (10 Questions)

Status of major horticultural crops in Tamil Nadu – Methods of propagation of major fruit crops - role of growth regulators – Soil and climate requirement - production technologies - nutrient and physiological disorders and its management - post-harvest technologies for Mango, Banana, Grapes, Papaya, Sapota, Guava, Citrus, Pomegranate, Ber, Annona, Amla, Apple, Pear, Avocado, Dragon fruit, Plum and Pineapple.

Importance of Vegetables – Nutritive Value - Methods of propagation of major vegetable crops - role of growth regulators – Types of Vegetable Garden: Kitchen Garden, Nutritional Garden, Truck Garden, Commercial Garden - Soil and climate requirement - production technologies - nutrient and physiological disorders and its management - post-harvest technologies for Tomato, Brinjal, Chillies, Bhendi, Onion, Cucurbits; Cauliflower, Cabbage, Turnip, potato, beetroot carrot, greens and perennials.

Importance of flower crops – Methods of propagation of major flower crops - role of growth regulators – Soil and climate requirement - production technologies - nutrient and physiological disorders and its management - post-harvest technologies for Jasmine, Rose, Chrysanthemum, Marigold, Tuberose, Crossandra, Cockscomb.

Garden Design – Formal and Informal Gardens – Components of Garden – Lawns and Lawn Making - Study of Important Flowering Annuals, Flowering and Foliage Shrubs – Flowering and Foliage Trees – Creepers and Climbers – Cacti and Succulents – Indoor Plants and Indoor Decoration – Cut Flowers – Flower arrangement – Bonsai Culture and dry flower decoration.

Importance of aromatic and spices, medicinal and plantation crops – Methods of propagation - role of growth regulators – Soil and climate requirement - production technologies - nutrient and physiological disorders and its management - post-harvest technologies for Spices – Pepper, Cardamom, garlic, Clove, Nutmeg, Cinnamon, Allspice, Turmeric, Ginger, tamarind, Coriander and Fenugreek. Plantation Crops – Coffee, Tea, Coconut, Arecanut, Cashew, Cocoa and Rubber. Medicinal Crops – Coleus, Gloriosa, Ashwagandha, Senna, Keezhanelli, Agave, Thulasi and Achorus.

Tissue culture and micropropagation of horticultural crops – Totipotency – Regeneration – Callus culture – Somaclonal variation – hardening of tissue culture plants.

Unit V: Breeding and Seed Production (20 Questions)

Field Crops – Importance – Classification – Agricultural and Industrial – Chemical Composition of Economic Parts in the Crops & Cereals, Millets, Pulses, Oilseeds, Fibres, Sugar and Starch Crops. Plant Photosynthesis – Respiration – Translocation of Assimilates. Floral biology – Reproductive and Pollination System in Plants – Mechanisms of promoting Self Pollination and Cross Pollination in crop plants – Plant genetic resources – importance – collection – characterization and conservation. Selfing incompatibility and male sterility- application and limitation – male sterility classification – GMS, CMS, CGMS, EGMS, and gametocides.

Breeding Techniques for Self Pollinated Crops – Pure line selection – Mass Selection – Hybridization and Selection – Pedigree Method – Bulk Method – Rice, Black gram, Groundnut. Two and three line breeding in rice. Breeding Techniques for Cross Pollinated and Often Cross Pollinated Crops – Mass Selection, backcross method - Heterosis Breeding – Development of Hybrids. Inbred development.

Single Cross – Double Cross and Poly Cross – Use of Male Sterile lines for Hybrid Seed Production – Synthetics and composites for crops like Maize, Cumbu, Redgram, Cotton, sorghum, Castor, Sunflower, Coconut. Breeding Methods for vegetatively propagated crops – Clonal Selection – Hybridization and

selection for crops like Sugarcane, Tapioca, Potato and fodder crops. Mutation in crop improvement – Polyploid in Crop Improvement – Inter Specific Hybridization. Importance and success stories. Geographical indications, PPV & FR Act and IPR.

Seed – Importance – Seed Quality Characteristics – Classes of Seed – Nucleus, Breeder, Foundation and Certified Seed – Guidelines for Seed Production – Multiplication Ratio – Seed Certification, general certification standards – Field Inspection and Certification – Seed Standards –Pollination and Role of Insects, Environmental and Edaphic Factors. Seed registration - Seed Production Techniques for Varieties and Hybrid in Rice, Maize, millets, Pulses, Cotton, Oilseeds, fodder crops and Important Vegetables: Tomato, Brinjal, Chillies, Bhendi, Lablab, onion and Cucurbits. Harvesting, Processing, Treatment, Storage, Seed Health and Marketing.

Unit VI: Plant Protection Principles and Practices (30 Questions)

Insects - Definitions – Characters – Economic Classification – Sericulture – Rearing of Mulberry silk worms – Apiculture – Role of Bees in Crop Productivity – Hiving Bees and Apiary Management. Beneficial Insects – Insect Pollinators – Predators and Parasitoids. Pest – Definition – Categories of Pests – Pest outbreak – Pest Monitoring – Pest Surveillance – Forecasting – Economic Threshold Level – Economic Injury Level. Pest Management Components – Cultural, Physical, Mechanical, Legal and Integrated Methods – Use of Resistant Varieties, Biological Control – Parasitoids, Predator and Microbial Agents.

Pesticides – Groups, Classification, Mode of Action – Formulation and Uses, Principles of Pesticides application – Hazards in the use of Pesticides and Environmental Pollution – Safe Handling of Pesticides new and organic pesticides – Pesticide residue - Behavior modifying chemicals – Use of Pheromones in pest management and behavioral modifying chemicals; approach.

Damage symptoms - life cycle and Integrated management practices of insect and non insect pests of Rice, Millets, Cotton, Sugarcane, Pulses, Oilseeds, Brinjal, Tomato, Bhendi, Cucurbits, Crucifers, Moringa, Tapioca, Chillies, Onion, Coconut, Arecanut, Turmeric, Curry-leaf, Coffee, Tea, Cardamom, Pepper, Betelvine, Flower crops, Mango, Citrus, Banana, Grapes, sapota, Guava, Pomegranate, Pests of stored materials and their management.

Plant diseases – definition, Causes of plant diseases – Fungi, Bacteria, Viruses and Mycoplasma – Categories of plant diseases – Mode of spread – Environmental factors influencing diseases out breaks. Control exclusion – Eradication – Immunization – Protection – Cultural – Methods of Control– Bio control – Economics of the new technologies, Useful fungi – mushroom, cultivation of Oyster mushroom, Trichoderma – utility – Nematodes – Types – Symptoms – Management.

Fungicide – Characteristics – Major groups – Formulation and Applications – Phytotoxicity – Precautions in using fungicides – Antibiotics in plant disease management. Bio technology and its application in disease management – Assessment of crop diseases and losses – Plant Disease Control - Principles - Integrated Pest Management of major diseases caused by Fungi, Bacteria, Virus and Mycoplasma in Cereals, Pulses, Oilseeds, Cash crops – Fruits – Vegetables – Plantation crops – Spices – Flowers and their management.

Unit VII: Livestock, Poultry Management, Artificial Insemination and Calf Rearing (10 Questions)

Significance and role of livestock and poultry in Indian economy – Various systems of livestock production – extensive – semi intensive – intensive – mixed – Integrated farming systems – Manure management methods – Definition of breed – classification of indigenous, exotic cattle and buffaloes – Breed characteristics of Sindhi, Kangeyam and Umblacherry, Jersey, Holstein Fricsian, Murrah and Surti. Breeding – importance of cross breeding.

Artificial Insemination – merits and demerits – Housing management – farm site selection space requirement for calves, heifer, milch animal and work bullocks – Type and design of house. – Systems of housing – Single row system – Double row system – head to head and tail to tail – merits and demerits – Care and management of new born calf and heifers – Care and management of pregnant, lactating animals and work bullocks.

Milk – Definition – clean milk production – methods of milking – hand and machine milking – Processing of milk – cooling Pasteurization – Definition – Various methods – Low Temperature Long Time and High Temperature Short Time – advantages and disadvantages.

Nutrition – Definition – Ration – Balanced composition of concentrate feed for dairy animal, calf and work bullock – Requirement and importance of green fodder, carrying capacity and forage cycle.

Diseases – classification – Viral, bacterial and metabolic – General control and preventive measures. – Viral Diseases – Foot and mouth – Bacterial diseases – Anthrax, Haemorrhagic septicemia and Black quarter – Metabolic – Tympanites, Ketosis and Milk fever – Mastitis and its control – Zoonotic diseases (Anthrax, Tuberculosis, Brucellosis and Rabies) – Prevention and control.

Sheep and Goat farming – classification of breeds of Indian and exotic origin – Systems of rearing – Housing management – Type design – Floor diagram – Space requirement for adult and young stock – Nutrition – common tree Fodder for small ruminants – Common ailments of sheep and goat – Sheep pox – Foot and Mouth – Blue Tongue – Enterotoxaemia – Ecto and Endo parasites Systems of poultry rearing – Backyard, Intensive systems; Nomenclature of commercial layers and broiler strains – Care and management of day old chicks – Brooder management. Systems of housing – Deep litter and cage systems – merits and demerits – Raised platform housing – Floor space requirement – litter management – care and management of layers and broilers.

Poultry Nutrition – composition of chick mash grower, layer, broiler starter and finisher mashes – Feed Conversion Ratio / dozen eggs or kilogram of meat. Classification of Poultry diseases – Viral – Bacterial – Protozoan – Causative organisms, symptoms, causes and prevention – Viral diseases – Ranikhet disease - Infectious bursal disease - Bacterial disease – E. coli – Coryza – Salmonellosis – Protozoan – Coccidiosis – Vitamin and mineral deficiencies – Schemes, Policies, Subsidies in Animal Husbandry by Tamil Nadu.

Unit VIII: Farm Machinery, Post Harvest Technology and Energy and Environment (10 Questions)

Thrashing Floor, drying floor. I.C. Engines – Types, Introduction – Preventive maintenance and minor repairs. Tractor – Different systems of a tractor – Hydraulic system – Clutch and Transmission system – Hitching of implements to Tractor – Power Tiller – and matching Implements. Seeders and planters. Plant Protection equipment –Harvesting machinery. Agricultural Pumps – Types of pumps – Custom hiring centre – e-vadagai.

Post Harvest losses in durable and Perishable crops – Moisture content – Methods of Determination – Drying – Sun Drying – Mechanical Drying – Merits and Demerits. Shelling and Decortication – Rubber Roll Sheller – Centrifugal Dehusker. Parboiling of Paddy – Merits and Demerits – Polishing – Milling of Corn and Pulses – Principles and Methods – Seed Treater – Types of Seed Treater. Storage of Grains and Seeds – Condition for safe storage – Value addition and suitable machineries for major food grains.

Energy Resources and Forms of Energy – Conventional and Non - Conventional Energy – Solar Energy – Merits and Limitations - Energy from Bio-Mass – Technologies – Classification and types of Bio-Gas Plants – Bio-Gas from Plant Wastes – Utilization of Bio-gas. Bio Fuel Plant – Gasifiers – Smokeless Chulas.

Ecology – Natural resources – Environmental Pollution and Management – Atmospheric Pollution – Particulate emission by industries and automobiles – Smog – Acid rain – Ozone hole – Global Warming – Causes, Effects and Control measures –Traditional farming methods – Eco-Safe technologies in agriculture.

Unit IX: Commercial Agriculture (20 Questions)

Bio-control agents - Role in pest and disease management – Categories of bio-control agents. Setting up a bio-control laboratory. Mass culture of tobacco caterpillar (*Spodoptera litura*) and gram pod borer (*Helicoverpa armigera*) - synthetic diet – mass production of SlNPV and HaNPV. Mass production of

Trichogramma spp., *Chrysoperla*, coccinellid predators, *Trichoderma viride*, *Pseudomonas fluorescens* and Entomo-pathogenic nematodes

Biofertilizers – Microorganisms for crop nutrition – Types – Sources of good quality strains – Facilities – equipment – and raw materials required – Types and specification of carrier material – production of azospirillium, azotobacter, Glucano acetobacter, phosphate solubilizer, potash releasing microorganism, PGPR, azolla, BGA, PPFM, and AM fungi – Shelf life and storage of carrier and liquid based biofertilizers – constraints in mass production – storage and preservation – quality standard of commercial biofertilizers – quality control biofertilizer lab in Tamil Nadu.

Mushroom - Morphology: common edible mushrooms - Pleurotus, Calocybe - poisonous mushrooms - Laboratory techniques: sterilization - Media preparation, pure culture techniques, sub-culturing and storage. Spawn: types of spawn, mother spawn and bed spawn. Cultivation: Oyster mushroom, Milky mushroom – Problems in cultivation: Biotic and abiotic disorders - Uses of mushroom: as food, nutraceutical and pharmaceutical values, composting coir-pith and other agro-wastes – Post harvest technology: methods of preservation and value addition.

Fruit and Vegetable processing – Equipments and Accessories used in processing – Preparation of Squash, Syrup, Cordial, Nectar, Ready to serve beverages – Fruit juice concentrate – Paste, Powder, Bar – Jam, Jelly, Marmalade and Candy, Preserve – Pickles – Oil, Salt and vinegar – Tomato products – Ketchup. Sauce, Puree and Paste – Canning of Fruit and Vegetables – Dehydrated Fruit and Vegetables and Re-hydration – Preservation by low temperature – cut-out analysis of canned Fruit and Vegetables – Evaluation of Frozen Fruit and Vegetables – Osmotic dehydration

Seed Production –Selection of field – Maintenance of genetic purity – Removal of offtypes – Isolation distance - Manual emasculation and Pollination - Hybrids – Single cross - double cross – Production of hybrid seed – Varieties – seed production - Use of gametocide – Merits and demerits of hybrids and varieties - Selfing, emasculation and crossing technique in Rice, millets, oilseeds, pulses, Cotton, Tomato, Bhendi – clonal multiplication – Cumbu napier – Seed registration – Field inspection and certification.

Harvesting – Physical and chemical indices – Extraction techniques – Seed processing – Use of cleaner, grader – Seed treatment – Seed packaging – Seed storage – Sanitation – Certification procedure.

Nursery Technology – preparation of land and seed treatment – Sowing and raising of rootstocks (Fruits and Flower Crops) – Application of Liquid Manure and plant protection of rootstock – Potting materials and Preparation of pot mixture – Potting of Rootstock and Hardening - Selection of Scion Plants and Grafting, Aftercare of Grafted Plants, Graft Separation and Hardening – Preparation of Cuttings of Ornamental Plants, Treating the Cuttings with growth regulators and Planting in Mist Chamber in Beds/Polybags, Potting of Rooted Cuttings and Hardening – Air Layering of Ornamental/Fruit Crops – Budding of Ornamental Plants (Rose) – Maintenance of Potted Plants – Packing and Marketing.

Organic composting - Nutrient potential of different organic manures – Preparation of FYM Compost – Composting methods - Preparation of enriched FYM – Coirpith composting – Sugarcane trash – Pressmud - Farm wastes and farm weeds - Parthenium composting – Determination of maturity indices of composts - Commercial utility of organic manures –Introduction to vermicompost – Types of Vermicompost - Materials for vermicomposting. Preliminary treatment of composting material – Small Scale vermicomposting – Large scale vermicomposting – Other types of vermicomposting – Requirements for vermicomposting – Bedding materials, container, pH, Moisture content, Temperature – Cover feed substrates - Selection of right type of worm species – Preparation of vermicompost beds – Collection of Vermicompost – Vermicompost efficiency – Transportation of live worms – Application of vermicompost

Unit X: Agricultural Extension Agricultural Economics and Digital Agriculture (30 Questions)

Rural Economics and Agricultural Economics – Meaning, importance and scope Sectors of Economy - Importance of agriculture in rural economy: Problems of rural economy – Population growth and its consequences. Agents of production: Land distribution – Size of land holding – Man-Land ratio -

Subdivision and Fragmentation – Land reform – Ceiling on land holding, Tenurial reforms, Consolidation of land holdings

Co-operative farming and Bhoodhan movement – Success and failure. Rural labour: Meaning – Classification – Characteristics of rural labour – agricultural labour – Employment, wages and income - Minimum wages Act and other welfare measures.

Rural Banking and Finance: Meaning and Concept – Classification and purpose

Sources of finance – Institutional and non-institutional – Government, cooperatives, nationalized commercial banks, regional rural banks and land development banks, private money lenders and other traditional sources – Establishment of NABARD and its role, Multi-agency, Service area approach. Rural industries: Importance and their classification – Investment needs – Generation of employment.

Types of agro-industries – Rural industries project - Khadi and Village Industries

Problems of rural industries – Potentials for development of agro- industries from agricultural products and wastes – Sugarcane, Cotton seed, Banana sheath, Forestry products – Rural technologies – Technology gap – Economic and social constraints in the spread of technology. Study of important and recent rural development schemes.

Marketing and agricultural marketing – Concepts - definition and scope – Classification of Markets – Structure – Characteristics of agricultural commodities: Problems in grading and standardization. Marketing costs and marketing margins. Price spread. Advantages and problems.

Cooperative agricultural marketing societies and regulated markets – Role of National Agricultural Cooperative Marketing Federation and TANFED. Role of specialized agencies viz., Food Corporation of India, Central Warehousing Corporation, State Warehousing Corporation in marketing of agricultural commodities and CCI – Role of Regulator Markets – Agmark – e-NAM.

Price support programmes – Buffer stock operations – Role of Commission on Agricultural Costs and Prices – Price stabilization. Agmark grading and commercial grading – Marketing information and intelligence – Marketing of agricultural inputs viz., seeds, fertilizers, plant protection chemicals and implements.

Sociology – Rural Sociology – Characteristics of rural society. Rural Youth – Their needs and aspirations. Basic rural institutions and voluntary agencies. Leadership – Classification, Characteristics and their influence. Motivation – Methods of Motivation. Social change. Adoption – Meaning, Stages, Adopter categories and their characteristics. Extension methods – Classification – Individual contact - group contact and mass contact methods. Extension aids – Audio aids, Visual aids and Audio Visual aids. Print and Electronic media. Photography, new achievements in communication technology – Transfer of Technologies through demonstrations – Field day – Exhibition – Mass media.

Visit to a village – Identifying resources, conducting participatory rural appraisal (PRA), conducting SWOT (strengths, weaknesses, opportunities and threats) analysis and preparing action plan for village development.

Visiting farmers – Analysis of farm resources and studying the life style of farmers, earnings, enterprises, expenditure pattern, technical information seeking behavior and dissemination of technologies. Finding the factors of adoption of technologies.

Problem diagnosis study – visiting farmers' fields, identifying technical and frequent problems like soil, pest, disease, disorders and other problems in agriculture, obtaining solutions from known sources and providing them to the farmers.

Visiting agro service centers – Studying the business techniques, farmers approach, distribution pattern, dealership pattern, knowing different agro chemicals available in markets and their prices, gaining experience in solving the farmers problems in agro service centers.

Visiting daily vegetable wholesale markets – uzhavar sandhai - assessing the price fluctuation and preparing price trend calendar for different vegetables. Preparing line chart for maximum price of different vegetables grown in the district and identifying optimum sowing period for different vegetables.

Study the potentialities, prospects and to get clear knowledge about starting agro industries and food processing industries – PMFME – Schemes and policies of Government of Tamil Nadu in Agriculture – Establishment – Farmers group – FPO – Role and Functions.

Application of computer in agriculture - Multimedia Presentation – power point - Internet and E- Mail – Online reporting system – Major Apps and Web Portals (Uzhavan app, Agris net portal, Tamil man valam and latest apps) for improving livelihood of farmers - Application of artificial intelligence and IoT in agriculture.

2. Chemical Engineering and Technology

(Diploma Standard)

Code: 452

Unit I: Chemistry and Thermodynamics (15 Questions)

Atomic weight and Atomic number- Molecular weight - equivalent weight- periodic table - Normality - Molality – Molarity - Boyle's law - Charle's law - General gas equation PV = n RT - Compressibility factor - Dalton's law of partial pressures - Avagadro's law and Avagadro's number - Le-Chatlier's principle – Thermodynamic process – Isothermal process, Isobaric process and adiabatic process – Properties of system – Extensive properties and Intensive properties with examples – State function and path function - First law of Thermodynamics - Internal energy - Enthalpy - Heat capacity - Relationship between Internal energy and Enthalpy - Second law of Thermodynamics - Entropy- Change of Entropy for an ideal gas - Third law of Thermodynamics – Gibb’s Free energy – Fugacity and Fugacity coefficient – Activity and Activity coefficient.

Unit II: Basic Engineering (25 Questions)

Stress – Strain – Hook’s law – Young’s modulus - Properties of steam, Boilers – Function of Boilers – Distinguish between fire tube boiler and water tube boiler – Refrigeration – Vapour compression refrigeration system – Capacity of refrigeration unit - Co-efficient of performance (COP) – Ton of Refrigeration - Types of Refrigerants - Electrical quantities and units - Ohm's law -Types of current - D.C. current and A.C current - principle and working of D.C. generator and D.C. motor – Transformers.

Fuels - Solid, liquid and gaseous fuels - Fuel properties - Calorific value of fuels - Octane number – Cetane number - Flash point - Fire point - Cloud point – Pour point – Smoke point– Freezing Point –Viscosity Index.

Unit III: Chemical Technology (25 Questions)

Inorganic Chemical Technology:- Sources of water - Hardness of water-water treatment by lime soda and ion-exchange process - Demineralization of water and its importance - Acids - raw materials, reactions, preparation and uses of Sulphuric acid by DCDA process, Nitric acid and Phosphoric acid, Alkalis - raw materials, reaction, preparation and uses of caustic soda and soda ash - Fertilizers - raw materials, reaction, preparation and uses of Ammonia, Urea and Triple super phosphate – Manufacture of Portland cement – Setting of cement – Manufacture of paint – Manufacture of glass – Various grades of glass.

Organic Chemical Technology:- Chemistry of oils and fats – Classification of oils – distinction between oils and fats – Hydrogenation of vegetable oil - definition of Acid value, Saponification value and Iodine value, definition of detergents and soaps – Manufacture of pulp by Kraft process – Classification of pulping process – Black liquor – Manufacture of paper from pulp - Petroleum - crude oil distillation – Cracking – Thermal cracking and catalytic cracking – Sweetening of petroleum – principles involved in Isomerisation,

Hydrocracking, Reforming, Visbreaking and Alkylation - Polymer – Classification of polymers – Methods of polymerization - Addition polymerization and condensation polymerization with examples, Thermoplastics and Thermosetting plastics, Raw materials, reactions, structure and uses of polyethylene, polypropylene, Nylon 6-6 from Caprolactum - Rubbers – Classification of rubber with examples – Manufacture of Styrene-Butadiene Rubber (SBR).

Unit IV: Stoichiometry (20 Questions)

Basic concepts of chemical calculations - gram atom and gram mole - methods of expressing composition – weight percent – mole percent –volume percent - Definitions of terms, tie-substance, inert material, limiting reactant and excess reactant - material balance - percentage conversion and yield - simple problems - combustion – Gross and Net calorific value – theoretical air requirement – flue gas analysis - Orsat analysis - Definitions and simple problems in heat of formation, heat of combustion, heat of reaction.

Unit V: Fluid Mechanics, Instrumentation and Control (10 Questions)

Fluids – Definition, properties of fluids – Density, Specific gravity, Viscosity - Dynamic viscosity and Kinematic viscosity and its units - Newton’s law of viscosity - Newtonian fluid and Non-Newtonian fluids with examples - Compressible and incompressible fluids - Manometers - U-Tube and inclined tube manometers – Reynolds number - Laminar and turbulent flow - Continuity equation and its significance - Bernoulli's equation and its significance - Pipe fittings and joints – Schedule number and BWG number – Valves - Types and functions – Pumps - Positive displacement pumps - Reciprocating pumps - Rotary pumps - Centrifugal pumps - Characteristics of centrifugal pumps - Priming and Cavitation – Fans, Blowers and compressors.

Process Instrumentation – process variables – static and dynamic characteristics of instruments – Instruments for measuring Pressure Temperature, Flow, Level - open loop and closed loop systems – Principles of Feedback and Feed Forward control systems - Controller classification such as P, I, PI, PD, PID and its applications - Heat Exchanger - control of temperature and flow rate - Batch Reactor -Control of temperature and pressure.

Unit VI: Mechanical Operations (25 Questions)

Types of size reduction - Energy required for size reduction – Laws of crushing-principle and working of Jaw and Roller crushers - Angle of nip - Ball mill - Critical speed of Ball Mill and Fluid energy mill – Sieve standards - Differential and cumulative screen analysis - Screen capacity and effectiveness, applications of Belt conveyor, Screw conveyor, Bucket elevator and Pneumatic conveyor - Principle and operation of Industrial thickener, principle and applications of Plate and Frame filter press , leaf filter and rotary drum filter - filter medium - filter aids - principle and application of centrifuge, cyclone separator and electrostatic precipitator – Mixing and agitation – Purpose of agitation – Functions of Baffles – Impellers, Types of impellers and its applications – Banbury mixer and ribbon blender.

Unit VII: Heat Transfer (20 Questions)

Steady state heat conduction - Fourier's law of conduction - Thermal conductivity – Natural and forced convection - Individual and overall heat transfer co-efficients – Condensation – Drop wise condensation and Film wise condensation – Boiling - Nucleate boiling and Film boiling – Dimensionless numbers - Prandlt number and Nusselt number - Radiation - Kirchoff's law and Stefan-Boltzmann law - Definitions of Blackbody – Grey body – Absorptivity - Emissivity, principles and operations of Double pipe heat exchanger, Shell and tube heat exchanger – LMTD - Forced circulation evaporator, Long tube vertical evaporator and Falling Film evaporator - evaporator capacity and economy - Boiling Point Elevation (BPE) and Duhring’s rule - Multiple Effect Evaporator.

Unit VIII: Mass Transfer Operations (20 Questions)

Fick's law of diffusion - Definitions of Absolute and Molal humidity – Dry Bulb and Wet Bulb Temperature – Relative humidity - Raoult's law and Henry’s law – Batch distillation - Rayleigh's equation - calculation of

number of trays by McCabe - Thiele method – Reflux – Total reflux, minimum reflux and optimum reflux – q line – Values of q based on feed conditions – Overall efficiency and Murphree plate efficiency – principle and application of steam distillation - Azeotropic distillation -Extractive distillation - Absorption - Choice of solvent for absorption, characteristics of packing - Random and regular packing, Loading and Flooding of packed towers, principle of liquid - liquid extraction - use of triangular charts - choice of solvent for extraction, mechanism of drying - critical moisture content - principle and applications of rotary, spray, tray and fluidized bed drier - principle of Crystallization, Leaching, Adsorption and its applications.

Unit IX: Chemical Reaction Engineering (15 Questions)

Chemical reaction – Classification of chemical reactions - Homogeneous and Heterogeneous reactions – Definition of reaction rate – Elementary and Non-elementary reactions – Molecularity and order of reaction – Rate law, Rate constant and Units of rate constant – Fractional conversion – Activation energy – Arrhenius equation – Simple problems in Arrhenius equation – Classification of chemical reactors – Concept of space time and space velocity – Construction, operation and application of Continuous Stirred Tank Reactor (CSTR), Plug Flow Tubular Reactor (PFTR), Fixed bed reactor and Fluidized bed reactor.

Unit X: Industrial Safety and Pollution Control (25 Questions)

Process Safety - Causes of Accidents - Unsafe acts and conditions - Material safety data sheet and its importance - Evaluating workers exposure to volatile toxicants, dusts and noise - Accident prevention - Safety training - Case study of accidents in process industry: Bhopal gas tragedy, India - Fukushima nuclear disaster, Japan – Fire – Classification of fires - Fire triangle - Different causes of fire – Fire extinguish techniques – Carbon dioxide fire extinguisher and dry chemical fire extinguisher - Distinction between fires and explosion – Lower and Upper flammable limits (LFL & UFL) – Runaway chemical reaction – Permit to work system – Hot work permit – Confined space vessel work permit – Height work permit – Function of flame arrestors – Personnel protective equipment and its importance - Pollution – Sources and types of Air pollution – Ozone depletion – Green House effect - Acid rain – Water pollution – Sources and types – Important terms in water treatment – BOD, COD and TDS – Primary treatment – Coagulation and Flocculation – Secondary (Biological) treatment – Activated sludge process.

3. Civil Engineering

(Diploma Standard)

Code: 443

Unit I: Engineering Mechanics (20 Questions)

Direct Stresses and strains (Tensile and compressive) due to Axial forces – Deformation of elastic bar due to uni-axial force – Composite Sections – Modular ratio – Relationship between elastic constants - Shear force and bending moment diagrams for statically determinate beams - Geometrical properties of sections - Stresses in beams due to bending – Flexural rigidity – Strength equation - Stresses in shafts due to torsion – Pin jointed perfect frames with vertical loads on nodal points (method of joints only).

Unit II: Mechanics of Structure (15 Questions)

Deflection of cantilever and simply supported beams for point and uniformly distributed loads – Shear force and bending moment diagrams for statically indeterminate structures (Propped cantilever, Fixed Beams, continuous beams, Non-sway Portal frames) using Mohr's theorems and moment distribution method.

Euler's and Rankin's formula for columns – Effective length for different end conditions - Stresses due to eccentric loads – combined stresses due to direct loads and bending moments in rectangular sections – Conditions for No tension (Circular, square and rectangular) – Stability of earth retaining walls.

Unit III: Construction Materials & Construction Practice (25 Questions)

Bricks, Lime, Tiles (Athangudi Tiles), Cement, Fine Aggregate, Coarse Aggregate, Timber, Ply wood, Steel, Glass, Plastics, PVC, UPVC, Paints, Mortars, Concrete – M-sand, P-sand – Latest construction Materials and construction Chemicals - Different types, qualities, requirements, standard specifications, Admixtures for cement mortar and concrete – Green Building Materials, Usage of PPC, Flyash Bricks, Solar Panels, Hollow clay Bricks (Tiles).

Different types of Foundations (Buildings Ocean, Harbour and other ordinary works) Masonry, Floors, Roofs, Interior Works, False ceiling – Wall paneling – Wooden flooring

Precast Block (Under Ground metro, metro slabs) Doors and Windows, Weathering Course, Damp proof course, Plastering, Painting, Colour Washing, Specifications for different works – Maintenance of created (Ocean & Harbours) assets.

Heritage structures – Construction, Traditional Flooring - Athangudi Tiles – List of Heritage Buildings.

Unit IV: Transportation Engineering (25 Questions)

Roads – Different types – methods of formation of water bound macadam Road, bituminous and concrete roads – Hill roads – Requirements – Camber, gradient, super elevation, carriage way, pavements, drainage system, sight distance etc., Traffic Engineering Bridges – Classification of bridges – Site selection and alignment – Foundation, substructure and super-structure.

Sub-grade soil – Soil mass as a three phase system – Grain size classification - Atterberg limits – IS Classification of soils–Compaction – Shear strength - Road Arboriculture – Express Highways – Rapid Transport System.

Railways – Formation of Tracks – Rails – Ballasts – Sleepers – Characteristics of materials – Rail Joints.

Harbour and Ocean structures – Component parts.

Unit V: Hydraulics (15 Questions)

Measurement of pressure in liquids – Pressure distribution and total pressure on immersed surfaces – Types of flow (Laminar, turbulent, steady, unsteady, uniform, non- uniform) – Flow through pipes – Losses, Frictional losses – Hydraulic gradient and total energy lines. Bernoullis theorem – use of Orifice, Mouthpiece, Hydraulic Coefficient Cd, Cc, Cv Orifice meter and Venturimeters – Flow through channels – Chez's formula – Bazin's and manning's formula – Economical sections for open channels, Conditions for Maximum discharge - Pumps – Reciprocating pumps – Centrifugal pumps – Characteristics – Selection and choice for pump - Discharge – Power and efficiency, Ground water – Types of well – Test for yield of wells.

Unit VI: Surveying and Remote Sensing (20 Questions)

Types of Surveys –Chain surveying – Compass surveying – Levelling – Contour surveying –Theodalite surveying – Trignometrical levelling – Tacheometry – Field work – Simple problems. Curves, Global Positioning System (GPS), Remote sensing – Photogrammetric Surveying and Hydrographic Surveying, Total Station and Geographical Information System (GIS) – Fundamentals of Remote sensing, Photogrammetry – Image interpretation & Analysis.

Unit VII: Environmental Engineering and Pollution Control (20 Questions)

Sources of water – Conveyance of water – Treatment of water – Quality of water – Tests on water – Distribution systems – Sewers – Collection and conveyance of sewage– Sewer Appurtenances – Drainage arrangements and Sanitary fittings in buildings – Effluent treatment plants - Treatment and disposal of sewage, Solid waste Management.

Environmental pollution Control - Air – water – Soil – Noise - Pollution Control.

Unit VIII: Estimating and Costing (20 Questions)

Systems of taking out quantities – Trade and Group systems – Material requirement for different items of works – Preparation of data for works – Report writing – Valuation of buildings and properties – Fixation of rents – Approximate estimates – Detailed estimate and Abstract estimate for buildings, wall, sump, septic tanks, compound wall, roads, Harbour – (Floating structures such as jetty, wharf groyne, Break water, quay wall), CMDA Rules and regulations – Buildings Bye laws.

Unit IX: Structural Engineering (20 Questions)

Reinforced cement concrete structure – Analysis and design of singly and Doubly reinforced rectangular and T-beam sections – Cantilever, simply supported, continuous beams – One way and two way slabs – Lintels and Sunshades – Staircases – Rectangular and Circular short Columns – Isolated column footings. (All designs by Limit State Method only) – Basics of Retrofitting (Roof slab, Column & Beam)

Steel structures – Design of Tension and compression members by L.S.M – Different forms of Tension members – Design strength of single Angle Tension member – Design of ties using single Angles and channel section – Design of simple Beams and welded connection by L.S.M – Web Design strength in Bending, Shear – Limiting deflection of Beam.

Unit X: Construction Management and Computer Applications (20 Questions)

Planning of a project – Factors to be considered – Project reports – Organization structure of construction departments – Construction planning – CPM and PERT networks – Contracts – Tenders and Tender documents – Bill- Supervision and Quality control – Safety measures in construction sites – Labour legislations - Banking practice – Cash flow diagrams - Financial Management.

Ethics in Engineering – Disaster Management – Types of Natural calamities – Causes – Preparedness – Response and Recovery.

Use of Computers – Application of CAD softwares – Project management softwares – Use of MS word, Excel, PowerPoint – Application of Design and Analysis softwares.

4. Civil and Mining Engineering

(Diploma Standard)

Code: 574

Unit I: Engineering Mechanics and Mechanics of Structures (20 Questions)

Direct Stresses and strains (Tensile and compressive) due to Axial forces – Deformation of elastic bar due to uni-axial force – Modular ratio – Relationship between elastic constants - Shear force and bending moment diagrams for statically determinate beams - Geometrical properties of sections - Stresses in beams due to bending – Flexural rigidity – Strength equation.

Deflection of cantilever and simply supported beams for point and uniformly distributed loads – Shear force and bending moment diagrams for statically indeterminate structures, (Fixed Beams, continuous beams, Non-sway Portal frames) using Mohr's theorems and moment distribution method.

Unit II: Hydraulics (20 Questions)

Measurement of pressure in liquids – Pressure distribution and total pressure on immersed surfaces – Types of flow (Laminar, turbulent, steady, unsteady, uniform, non- uniform) – Flow through pipes – Losses,

Frictional losses – Hydraulic gradient and total energy lines. Bernoullis theorem – use of Orifice, Mouthpiece, Hydraulic Coefficient Cd, Cc, Cv Orificemeter and Venturimeters – Flow through channels – Chez's formula – Bazin's and manning's formula – Economical sections for open channels, Conditions for Maximum discharge. Sources of water – Conveyance of water – Treatment of water – Quality of water – Tests on water –Distribution systems

Unit III: Surveying (20 Questions)

Types of Surveys –Chain surveying – Compass surveying – Levelling – Contour surveying –Theodalite surveying – Trignometrical levelling – Tacheometry – Field work – Methods of determining areas and volumes – Simple problems. Curves.

Unit IV: Advanced Surveying (20 Questions)

Global Positioning System (GPS), Remote sensing – Photogrammetric Surveying and Hydrographic Surveying,Total Station and Geographical Information System (GIS) – Fundamentals of Remote sensing, Photogrammetry – Image interpretation & Analysis – Drone Surveying.

Unit V: Construction Management and Computer Applications (20 Questions)

Planning of a project – Factors to be considered – Project reports – Organization structure of construction departments – Construction planning – CPM and PERT networks – Contracts – Tenders and Tender documents – Bill- Supervision and Quality control – Safety measures in construction sites – Labour legislations - Banking practice – Cash flow diagrams - Financial Management.

Ethics in Engineering – Disaster Management – Types of Natural calamities – Causes – Preparedness – Response and Recovery.

Use of Computers – Application of CAD softwares – Project management softwares – Use of MS word, Excel, PowerPoint – Application of Design and Analysis softwares.

Unit VI: Mining Geology and Mine Development (20 Questions)

Mineralogy, structural Geology: Geological features like faults, folds, etc., Economic Geology: Different Prospecting Techniques: Reconnaissance; principles and methods of prospecting – by pit, shaft, trench and boreholes; Coal and petroleum geology.

History of mining – contribution of mining in the human civilization and national economy, Indian mineral resources and world status – role of mining engineers in industry - mode of entries – applicability and limitations comparison of opencast vs underground mining and drilling methods –selection of drilling methods – exploration and production drilling – drilling techniques – Rotary, Percussive, Rotary-Percussive; Down the hole drilling vs Top hammer drilling, Shaft sinking. Types of explosives and initiating systems used in mines and quarries.

Unit VII: Mining Methods (20 Questions)

Bench parameters, haul roads, selection of equipment, different types of opencast equipment like excavators, transport (road, conveyors) different types of explosives and initiating systems used, drilling and blasting patterns used in opencast mines, fly rocks, air over pressure, controlled blasting in granite quarries, Overburden removal and disposal, design of waste dumps, mine closure plan, failure of slopes and various controlling and stabilization methods, introduction to hydraulicking, dredging, leaching, etc.

Unit VIII: Mine Management, Legislation and General Safety (30 Questions)

Mine organizational structure, ownerships of industries, organization, risks and rewards, recruitment and training, Mines Act 1952, Mines Rules 1955, Metalliferous Mines Regulations 1961, Directorate General of Mines Safety (DGMS) issued technical Circulars, Vocational Training rules 1961, Granite Conservation and development rules 1999, Tamil Nadu Minor Mineral Concessional rules 1959 and Environmental Protection Act 1986, Forest Conservation Act 1980, Environmental impact assessment (EIA) notifications – 1994 and 2006, Environmental clearance procedures for mining projects, Ministry of Environmental Forest and Climate Change issued notifications, Office Memorandum and circulars, Safety Audit in mines, Accidents analysis and Compilations of investigation reports.

Unit IX: Mine Surveying (15 Questions)

Linear measurements, compass surveying, true meridian, magnetic meridian open & closed traverse, traversing with compass and chain, permissible errors, leveling — contouring and subsidence surveying, theodolite — temporary and permanent adjustments, permissible error for surface and underground and their distributions, correlation survey: tachometry, dip, strike, fault problems, EDM, GPS —DGPS, total station, introduction to remote sensing.

Area and volume calculation; different methods and their limitations; earth work and building estimation; laying out of rail and haul road curves; determination of azimuth latitude and longitude. Borehole surveying and calculations; dip, strike, outcrop and fault problems. Development sampling:- Channel and block averaging milling widths; observe plans. Types of plans for opencast workings; their preparation, care, storage and preservation, legislation concerning mine plans and sections; duties and responsibilities of surveyors. Geological map reading. Application of computers in mine surveying and preparation of plans. 3D laser profiling of bench walls in opencast mine.

Unit X: Mine Planning and Design and Computer Applications in Mining (15 Questions)

Estimation of ore reserve based on bore hole data, design of mine openings, design of bench geometry, design of opencast mines, optimum blast design, pillar design problems, design of support system in u/g mining, Environmental impact assessment (EIA) and preparation of Environmental Management Plan (EMP) of mines. AutoCAD, Basic concepts of mine planning software such as SURPAC, DATAMINE, VULCAN etc. and other auxiliary software related to surveying, planning and design in mines.

5. Electrical and Electronics Engineering

(Diploma Standard)

Code: 446

Unit I: Circuit Theory and DC Machines (25 Questions)

Electrostatics - Basic Concepts of Electricity - Ohm's Law, Kirchhoff's Laws, Series, Parallel and Series-Parallel Circuits - Network Theorems (Mesh Analysis, Nodal Analysis, Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems) - Star–Delta transformation - Source Transformation (Simple problems in DC only) - Single Phase AC and 3 Phase AC Circuits - Resonant Circuits - Electromagnetism - DC Generator - Types - Construction - Working - EMF Equation - Characteristic Curves - Armature reaction - Applications - DC Motor - Types - construction - Working - Characteristics - Commutation - Applications - Speed Control - D.C Starters - Losses in DC Machines - Testing of DC Machines - Maintenance of DC Machines - Storage Batteries - Special DC Machines - PMDC - DC Servor Motor - Stepper Motor - Variable Reluctance Stepper Motor - Permanent Magnet Stepper Motor.

Unit II: AC Machines (25 Questions)

Single Phase Transformer - Construction - Principle of Operation - EMF Equation - Vector Diagram - Regulation, Losses and Efficiency - OC & SC Test - Parallel Operation - Auto Transformer - All day Efficiency - Three Phase Transformer - Construction - Testing - Parallel operation - Grouping of Transformer - Maintenance - Alternator - Construction - EMF Equation - Parallel operation - Testing - Determination of voltage regulation - Synchronous Motor - Construction - Starting Methods - Characteristics - Applications - 3 Phase induction motor - Types - Construction and Working Principle - Characteristics - Phasor Diagram - Starters - Speed Control - Maintenance - Single Phase Induction Motors - Working Principle - Types - Applications - Special AC Machines - Permanent Magnet Synchronous Motor, SRM, AC Servor Motor - Linear Induction Motor.

Unit III: Measurements and Instruments (25 Questions)

Classification and characteristics of instruments - Operating forces - Construction and Working of MI, MC and Dynamometer type instruments - Extension of Instrument Range - Instrument transformers - Direct measurement of current, Voltage and Resistance - Measurement of Power - Measurement of Energy - Single Phase and 3 Phase Energy meters - Measurement of power factor - Maximum demand indicator - Synchroscope - Measurement of frequency - AC Bridges - Anderson bridge - Schering bridge - Cathode ray Oscilloscope - Sensing elements – Transducers - Passive, active transducers.

Unit IV: Electronic Devices and Circuits (15 Questions)

Semi conductor Diodes - Rectifiers - Half wave, full wave and Bridge rectifier - 3 Phase rectifiers - Filter - Types - Capacitor filter - Inductor filter - L Section filter - ∏ Section filter - RC Filter - Bipolar Junction Transistors (BJT) - Biasing - configuration - Field effect Transistors (JFET & MOSFET) and Unit junction Transistor (UJT) - Transistor Oscillators - Special semiconductor devices - Gunn diode, varactor diode, Zener diode, Tunnel diode - Silicon controlled Rectifier - DIAC - TRIAC –IGBT - Optoelectronic devices - LDR, LED, LCD, Opto coupler, IR transmitter and receiver,Laser diode , Solar cell, Photo diode, Photo transistor - Diode clipper - Diode clamper - Voltage Multiplier - Multi vibrators - Astable, Monostable, Bistable - Schmitt trigger - Seven Segment LED - Amplifier - RC Coupled amplifier - Emitter follower - Oscillator - Hartley Oscillator, Colpitts Oscillator - RC Phase Shift Oscillator.

Unit V: Analog and Digital Electronics (15 Questions)

Operational amplifiers Specifications - characteristics - Applications - Number system - Boolean algebra - De-Morgan's theorems - Logic gates - Digital logic families - Combinational Logic Circuits - Sequential Logic Circuits - Flip-flops, Counters, shift registers - Memory devices - D/A and A/D converters - Special function ICs - IC555 timer - IC565 - IC566 - IC Voltage regulators - Karnagh map (Upto 4 Variables) - Half adder - Full adder - Half Subtractor - Full Subtractor - Parity Generator and Checker - Decimal to BCD Encoder - 3 to 8 Decoder - 4 to 1 Multiplexer - 1 to 4 Demultiplexer - Flipflops - JK - RS - Edge triggered FF - D-FF - T-FF - Counters - Up counter - Down counter - Decade counter - Mod N counter - Shift register - Memories - ROM - RAM.

Unit VI: Generation, Transmission and Switch Gear: (25 Questions)

Generation of Electrical Energy - Conventional Methods, Co-generation Methods - Inter Connected System - Load Curve - Load duration curves - Demand factor - Capacity Factor - Load factor - Diversity factor - Base Load and Peak load plants - Renewable Energy Sources - Solar power generation on grid and off grid solar power - Different types of PV Panels - Wind - Tidal - Bio - Geo - Hybrid - AC Transmission - HV Transmission - Voltage Regulation - Transmission efficiency - Over Head lines - Constants of TL - Transposition of TL - Skin, Ferranti effect - Corona - HVDC Transmission - Facts Controllers (Statcom, UPFC) - Line Insulators - String Efficiency - Underground Cables - Types of Cables - Laying of Cables - Switch gear - Circuit Breaker [ELCB,SF6, Vacuum CB, Oil CB] - Fuses [HRC, HV, Cartridge, Liquid Type and Metal clad] - Over Voltage Protection - Lightning Arresters - Protective relays - Grounding - Renewable Energy.

Unit VII: Distribution and Utilisation (25 Questions)

AC and DC Distribution - Substations - Indoor SS - Outdoor SS - Feeder - Distributors - Fault Analysis - Protection System - Busbar system - Industrial Drives - Types of electric drives and choice of electric motor - Electric Traction - System of track electrification - Traction mechanics - Traction motors and control - Magnetic levitation - Illumination - Laws of illumination - Lighting systems - Construction and Characteristics of Arc, Incandescent, Sodium vapour - CFL and LED lamps - Electric heating - Electric furnaces - Electric welding - Electric welding equipments.

Unit VIII: Micro Controller and its Application (10 Questions)

8051 micro controller - Architecture - Instruction set - Assembler directives - Addressing modes - Programs - I/O programming - Timer/Counter programming - Serial communication - Interrupts - IC 8255 - Interfacing techniques with 8051 - Applications - PIC Micro Controller - Arduino - Raspberry Pi - Introduction to IOT - Architecture of IOT Systems.

Unit IX: A. Power Electronics and Drives (20 Questions)

Thyristor family - SCR Triggering Circuits [R, RC, UJT, Pulse Transformer triggeing circuits - IC based Triggering Circuits] - Driver and Buffer Circuits - Commutation Circuits - Phase Controlled Rectifier - Thyristor Protection - Choppers - SMPS - Inverters - UPS - Control of DC Drives – Rectifier Based Control, Chopper Based Control - Closed Loop Control - Control of AC Drives [Stator Voltage Control, Variable Frequency Control, v/f Control Rotor resistance control] - Closed Loop Control - Micro Processor based PWM Control - Static Var Compensation - Cyclo Converters.

B. Electrical Estimation & Energy Auditing

Indian Electricity Rules - 1956-Standard symbols for various wiring items, accessories - Types of Internal Wiring - Service Connection (Over Head and Under Ground) - Quantity of Material Required in Electrical Installation - Wire Size - Selection of fuses - Earthing - Testing of installations - Domestic, commercial and industrial installation estimate - Energy auditing - Need of Energy audit and management - Types of Energy audit - Audit Process - Electrical Measurement - Load and Power factor measuring equipment - Energy conservation - Selection of cable - Lighting systems - Pumping systems.

Unit X: Control of Electrical Machines: (15 Questions)

Control Circuit Components [Switches, Relays, Timers, Contactors] - Simple Motor Control Circuits - DC Motor Control Circuits - Starters, Jogging, Dynamic braking, Plugging, Reversing Control - AC Motor Control Circuits -Starters - 2 Speed Motor Control - Reversing the Rotation of IM - Dynamic braking - Plugging - Industrial Control Circuits [Planner Machine - Skip Hoist - Water pump - Electric Oven - Air Compressor - Over Head Crane - Battery Operated Truck - Conveyor System - Elevator] - PLC - Components of PLC - Operation of PLC - Scan - PLC Memory - i/p and o/p Module - Programming, Programming Devices - Ladder Diagram (Relay, Timer, Counter) - DOL, λ/Δ Starter - EB to Gen - SCADA - DCS.

6. Handloom Technology, Textile Technology and Textile Manufacture

(Diploma Standard)

Code: 445

Unit I: Fibre Properties and Man-Made Fibre Spinning (15 Questions)

i) Definition of Textile Fibre, Properties required for an ideal Textile Fibre of textile fibres
ii) Classification of Textile fibres – vegetable, animal, mineral, regenerated and synthetic fibre
iii) Microscopic, physical and chemical test methods for fibre identification
iv) Physical, Chemical properties and uses of Vegetable fibres – Cotton, Jute, linen
v) Physical, Chemical properties and uses of Animal fibres – Wool, Silk

vi) Physical, Chemical properties and uses of Regenerated Cellulosic fibres – ViscoseRayon, Uses of HT Rayon
vii) Physical, Chemical properties and uses of Synthetic fibres – Polyester, Nylon 6, 6 and Acrylic
viii) Requirements of fibre forming polymers, Spinning of Polymers - Melt Spinning, Wet spinning, Dry spinning
ix) Post Spinning Operations – Drawing, Crimping, Heat setting and Texturisation

Unit II: Spun Yarn Formation (20 Questions)

i) Ginning – Objects and Principles – Types of Ginning machines
ii) Objectives / Principles of opening, cleaning and mixing / blending machines
iii) Blowroom, card – Objects and Principles
iv) Draw frame, comber preparatory, comber, speed frame – Objects and Principles
v) Ring spinning – Object and Principle
vi) Doubling : Ring doubling, Two for One Twister (TFO) – Objects and Principles
vii) Working principles and features of rotor,air jet, air vortex and compact spinning systems
viii) Yarn conditioning, reeling, bundling and baling

Unit III: Fabric Formation (25 Questions)

i) Objectives of weaving preparatory processes
ii) Winding : Drum, precision and pirn winding - Yarn clearers, tensioners, knotters and splicers
iii) Warping –Types of warping and Creels
iv) Sizing –Ingredients, Size recipes for cotton and its blends with polyester and viscose.
v) Principles of Drawing-in and Denting.
vi) Primary, Secondary and Auxiliary motions of loom, Loom timing diagram.
vii) Tappet, Dobby and Jacquard shedding,
viii) Drop Box and Terry mechanism, Features of semi-automatic loom and automatic loom.
ix) Principles of Shuttle-less Weft insertion systems – Projectile, Rapier, air jet and waterjet looms.
x) Fabric defects – causes and remedies

Unit IV: Textile Calculations (20 Questions)

i) Calculations of speed, draft, hank, production and efficiency in spinning machines.
ii) Production and efficiency calculations in Winding, Warping, Sizing and Weaving
iii) Yarn numbering system: Indirect count systems – English, Direct count systems – Tex and Denier.
iv) Conversion of yarn count from one system to other.
v) Resultant count of folded yarn, Average count
vi) Reed, heald and fabric cover calculations
vii) Ex. Mill price calculation of one Kg of yarn and One meter of fabric

Unit V: Fabric Structure (15 Questions)

i) Elements of woven fabric design – Design, draft and peg plan – Colour and weave effect
ii) Construction of Weaves - Plain weave and its derivatives, Twill weave and its derivatives, Sateen and Satin
iii) Crepe, Honey comb, Brighton honey comb, Mock-leno, Huck-a-back, Bedford cords, Welt, pique,
iv) Backed cloth,Double Cloth, Triple Cloth
v) Extra warp and Extra weft figuring
vi) Terry Pile: 3 pick, 4 pick terry weave - Velvets and Velveteens
vii) Gauze and Leno structures

Unit VI: Chemical Processing (20 Questions)

i) Singeing, Desizing, Scouring, Bleaching and Mercerization – Objectives, Machines and Methods
ii) Dyes and their Classifications - Direct, Reactive, Vat, Acid, Basic and Disperse dyes.
iii) Dyeing of cotton, silk, wool, polyester and blends
iv) Dyeing machines – Winch, Jigger, HTHP, Soft-flow dyeing machine
v) Styles of printing – Direct, Resist and Discharge.
vi) Printing Methods – Roller, Rotary Screen, Flat bed
vii) Mechanical and chemical finishing – calendering, anti-shrink, resin finish,water repellent finish, flame retardant finish, Anti-microbial and UV protective finish

Unit VII: Knitting, Garments & Modern Developments in Handlooms (20 Questions)

i) Knitting - Objects, Comparison between knitting and weaving – Comparison between knitted and woven fabrics
ii) Knitting elements and their functions – Terms and Definitions
iii) Basic weft knitted structures and their properties – Plain, Rib,Interlock and Purl.
iv) Basic warp knitted structures and their properties – Tricot, Lockknit and sharkskin
v) Garments – Grey fabric inspection - Standard Body measurements - Pattern making and grading
vi) Spreading, Cutting, Sewing and Merchandising
vii) Developments in Handlooms – Solid border weaving, multiple putta weaving, Electronic Jacquard for handlooms.

Unit VIII: Testing and Quality Control (20 Questions)

i) Definition – Mean, Median, Mode, SD, SEand CV %.
ii) Calculations related to test of significance and control charts.
iii) Sampling techniques – Objectives and types of sampling
iv) Humidity control – Standard Testing atmosphere, Measurement of Relative Humidity.
v) Measurement of fibre length, strength , fineness, maturity and trash
vi) Determination of yarn count – twist per unit length – Strength: CSP, RKM and Elongation
vii) Evenness, Imperfections and Hairiness
viii) Determination of fabric strength, stiffness, handle, drape, thickness, GSM
ix) Crease resistance, abrasion resistance, pilling resistance, air / water permeability, dimensional stability.
x) Determination of fastness to washing, rubbing, light.

Unit IX: Nonwovens, Technical Textiles and Handloom Fabrics (25 Questions)

i) Classification of Nonwovens - Mechanical, Thermal and Chemical bonded fabrics
ii) Technical Textiles – Medical textiles, sports textiles
iii) Geo textiles, Agro textiles
iv) Automotive textiles and protective textiles
v) Quality Particulars of Handloom fabrics – Sarees, dhotis, bedsheets, towels, lungies
vi) Traditional Handloom Sarees – Banaras, Kanchipuram, Arani and Sungudi

Unit X: Textile Mill Management (20 Questions)

i) Plant location, Lay out, material handling in textile mills
ii) Production, Planning & Control
iii) Inventory control and its tools : ABC Analysis, Economic Ordering Quantity
iv) Total Quality Management : 5S Concept, ISO 9000, ISO 14000 , SA 8000 Certifications
v) Human Resources Management – Selection, recruitment, training and placement

vi) Factories Act 1948

vii) Role of Bureau of Indian Standards (BIS), Apparel Export Promotion Council (AEPC), Handloom Export Promotion Council (HEPC), Weavers Service Centre (WSC) and Textile Committee

viii) Export Pricing methods – Free On Board (FOB), Cost Insurance Freight (CIF)

ix) Export Procedure - Letter of Credit (LC), Shipping Bill, Bill of Lading (BIL)

x) Pollution Control: Types - Air, Water, Noise; Characteristics of Effluent and Effluent treatment of Wet Processing industry.

.

7. Horticulture

(Diploma Standard)

Code: 432

Unit I: Basic Horticulture and Plant Propagation (30 Questions)

Horticulture – Definition, scope and importance, Division and classification of horticultural crops – Horticultural zones in India and Tamil Nadu – Cropping systems - Precision farming- Planting systems – HDP and UHDP- Irrigation systems – Nutrient application methods in horticultural crops – Weed management – Training and Pruning system– Special horticultural practices – Maturity indices – Harvesting methods, pre-cooling – Packaging - Storage of horticultural crops - Protected cultivation.

Propagation - Tools and implements - Media and Containers - Types of nursery beds - Seed treatment - Sowing – Protray nursery-seedling production - Potting, depotting and repotting of plants - Methods of asexual propagation through cuttings, layering, grafting and budding - Plant propagation structures - Mist chamber and shade net – Hardening and maintenance – Polyhouse-Application Growth regulators in propagation – Nutrient management and plant protection measures – Record keeping and maintenance-nursery act and certification.

Unit II: Soil and Fertility, Irrigation and Weed Management (20 Questions)

Soil types- Physical and chemical properties- Soil organic matter and its importance- Essential nutrients for crop plants - Major, secondary and micro nutrients – Manures and fertilizers – Types of fertilizers – Straight, Complex, Compound, Mixed, Fortified, chelated and water soluble fertilizers and their reactions in soil. Soil fertility – INM practices– soil health card-Problem soils – Acid, saline and alkaline soils - Reclamation and management-Rootstocks for problem soils.

Irrigation – Sources of water for irrigation –Critical stages of water requirement – Irrigation scheduling and fertigation – Irrigation methods-water conservation methods. Study of weeds -methods of weed control–Herbicides for weed management in horticultural crops– Integrated weed management practices.

Unit III: Production Technology of Fruits and Vegetables (30 Questions)

Area, production and importance of fruit crops in Tamil Nadu – Major fruit producing districts in Tamil Nadu-Layout of orchard - Physical features in orchard - Study of cultural practices of Tropical fruits – Mango, Banana, Grapes, Papaya, Sapota, Guava, Acidlime, Jackfruit, Dragon fruit. Sub-tropical and temperate fruits – Pineapple, Avocado, Mandarin orange, Apple, Pear, Plum, Strawberry with reference to soil, climate, varieties / hybrids methods of propagation (rootstocks), nutrient, irrigation and weed management practices – Training and pruning –Growth regulators – Maturity standards for harvesting – Post-harvest handling of fruit crops – Yield – Grading – packing – Storage and value added products – HDP/UHDP-Top working, double working and rejuvenation of old orchard- Organic fruit production and certification-Good Agricultural Practices (GAP).

Dry land horticulture – Arid and semi arid zones in Tamil Nadu and India. Crops suitable for dry land production – Important varieties, climate and soil requirements, commercial propagation methods - Spacing and planting systems - Cropping systems and intercropping – Mulching – Management of

nutrients, water, weeds and problem soils –Training and pruning - Use of plant growth regulators – Post-harvest handling of Aonla, custard apple, pomegranate, ber, jamun, manila tamarind and wood apple - Soil and moisture conservation methods – Anti-transpirants.

Area, Production and importance of vegetable cultivation in Tamil Nadu –Kitchen garden-roof garden-vertical garden– Truck garden and market garden –soil and climate requirement – varieties / hybrids – Seed rate – Sowing -nursery practices – Protray nursery – Transplanting – Manuring – Irrigation – Fertigation - Nutrient deficiency and their corrective measures - Use of growth regulators - Special horticultural practices (training, staking, pruning) – Physiological disorders and corrective measures – Maturity indices - Harvesting – Grading, sorting – Packing and storage and yield for important vegetable crop; Tomato, Brinjal, Chillies, Bhendi, Onion, Bittergourd, Ridgegourd, Snake gourd, Pumpkin, Water melon, Musk melon, Ash gourd,Tapioca, Yams, Colocasia, Cabbage, Cauliflower, Radish, Carrot, Beet root, Amaranthus, Moringa, Potato, Cluster beans, Lab lab, Peas and Beans.

Unit IV: Production Technology of Flower Crops and Landscaping (30 Questions)

Importance of commercial flower crops – Area and production - Study of cultural practices of commercial loose flowers – Rose, Jasmine, Tuberose, Chrysanthemum, Marigold, Crossandra, Celosia, Nerium and Gomphrena. Floral concrete and pigment extraction from loose flowers -Protected structures for cut flower production – Study of cut flower production techniques of Rose, Carnation, Gerbera, Chrysanthemum, Orchids, Anthurium, Lilium, Alstroemeria, Lisianthus, Heliconia, fillers (Asparagous, limonium, gypsophylla) and foliage (dracaena and xinadu). Post-harvest management of cut flowers – Floral decorations, bouquets and dry flowers – Grading, packing and marketing of flowers-Flower Auction centres in Tamil Nadu.

Importance of ornamental gardening, landscaping and nursery business– Principles and styles and types of garden - Features of garden - Garden components and adornments – operations in planting and maintenance of trees, annuals, shrubs, climbers, creepers, herbaceous perennials, ferns, cacti and succulents, palm and cycads – Sunken garden, roof garden, rockeries, vertical garden and plant choices-Bonsai making- Lawn and lawn making – sports turf- Flower arrangements and dry flower making.

Unit V: Production Technology of Spices, Plantation Crops, Medicinal and Aromatic Crops (30 Questions)

Area, production and Importance of spice crops in Tamil Nadu – Study of production techniques of important spice crops Pepper, Cardamom, Turmeric, Ginger, Clove, Nutmeg, Cinnamon, Tamarind, Curry leaf and Coriander. Harvesting and processing – grading and packing – Organic farming and GAP in spice production.

Area, production and Importance of plantation crops in Tamil Nadu - Study of cultural operations for Tea, Coffee, Rubber, Cocoa, Cashew, Coconut, Arecanut, Oil palm and Palmyrah – Harvesting and Processing – Grading and packing - Organic farming and GAP in plantation crops.

Area, production and Importance of medicinal and aromatic plants in Tamil Nadu - Contract farming - production technologies – Medicinal crops : Glory lily, Medicinal Coleus, Senna, Periwinkle, Gymnema, Ashwagandha, Phyllanthus, Kalmegh and *Aloe vera.* Aromatic plants: Japanese mint, Rosemary, Lemon grass, Citronella, Palmarosa, Vettiver, Geranium, Patchouli and basil.

Unit VI: Insect Pest and Diseases of Horticultural Crops and Their Management (20 Questions)

Pest - Categories – Pest management - Principles and components. Natural enemies. IPM – different types of traps - Management strategies for important insect pests groups – Chewing insects - Stem borers – Fruit borer – Sap feeders of important fruit, vegetable, spices, medicinal and plantation crops - Special pest management strategies in storage pests and poly house. Management techniques for plant parasitic nematodes –Etiology, symptoms and integrated management of important diseases.

Important pest and diseases of Fruits: Mango, Banana, Citrus, Grapes, Guava, Sapota, Pomegranate, Papaya, Jack, Pineapple, Ber, Apple, Pear, Plum Vegetables: Brinjal, Tomato, Bhendi, chilies, Cucurbits, Moringa, Crucifers, Beans, Peas, Potato and Cassava. Spices and condiments: Onion, Garlic, Chillies, Cardamom, Pepper, Turmeric, Ginger, Coriander, Clove and Nutmeg. Plantation crops: Tea, Coffee, Cocoa, Rubber, Ccoconut, Arecanut and Cashew. Flowers: Jasmine, Rose, Crossandra, Chrysanthemum, Tube rose, Medicinal plants: Gloriosa, Senna, Coleus, Aloe vera, Solanum nigrum and Aswagandha.

Unit VII: Post Harvest Handling and Value Addition of Horticultural Crops (20 Questions)

Scope and importance of post harvest technology in horticultural crops - Washing, grading, sorting - pre cooling and pre treatments - Blanching and peeling methods – Post- harvest handling methods: Dehydration, Canning of fruits and vegetables – Thermal processing - Low temperature processing - Cold storage - Controlled and atmospheric storage - Refrigeration truck, ripening chamber, packaging for horticultural crops - Value addition in horticultural crops. Fruits : Jam, Jelly, Squash, RTS and Candy. Vegetables : Pickle, chutney, sauce and ketchup. Spices – Oleoresins, masala powders and mix - Food safety standards, National : Agmark, BIS, FSSAI and HACCP, International – Codex and ISO.

Unit VIII: Livestock Management and Poultry Production (5 Questions)

Significance of Livestock and Poultry - Various systems of livestock production – Important cattle Breeds - Artificial Insemination - Housing management - Feeds and fodder – Major cattle diseases and management. Sheep and Goat farming - Important breeds - Economic traits - Systems of rearing - Housing management - Nutrition - Common diseases, Ecto and endo parasites - Prevention and Control.

Poultry farming - Commercial strains of layer and broiler - backyard poultry - country birds - Housing management - Brooding management - Deep litter - Cage system -Nutrition of Chick - Grower and Layer and Broiler – Diseases - Causative organisms – Symptoms – Vaccination - Disease control and Prevention.

Unit IX: Commercial Agriculture (7 Questions)

Seed Production - varieties –Hybrids- emasculation and Pollination –isolation distance-rogueing-planting ratio-seed production techniques of Tomato, Brinjal, chilli, bhendi, onion, gourds, cluster bean, moringa, Amaranthus– Extraction techniques – Seed processing – Seed treatment – Seed packaging – Seed storage –Seed act-Seed inspection and Certification.

Bio-Control Agents - Importance – Examples of bio-control agents – Role in pest and disease management – Categories of bio-control agents- Spawn and Mushroom Production - Oyster and button - Organic Composting – Enriched FYM-Vermi compost-preparation of vermi beds-coir compost-quality standards.

Unit X: Farm Management, Marketing and Extension Education (8 Questions)

Farm Management – types and systems of farming-collective farming - farm planning and budgeting- risk and uncertainty- Horticultural Marketing-demand and supply- Marketing costs and marketing margins - Warehousing – Processing - Cold storage - Marketing agencies and institutions - Cooperative marketing societies - Role of regulated markets – NAFED – TANFED – NHB - Commodity boards - Marketing of agricultural inputs - Market information and intelligence - AGMARKNET, DEMIC, DMI, Uzhavar Sandhai - Farmers Producers Organisation.

Agricultural Extension – methods of Communication mass contact methods. Participatory Rural Appraisal techniques. Audio - Visual aids –Farm Journalism –writing for media. Information and Communication Technology (ICT) – Computer networks, internet, video conferencing, agriportals, Kisan Call Centre, mobile apps. Geo tagging, Photography – Basic concepts, advancements.

New governmental schemes, flagship programmes, policy notes, Duties and responsibilities of AHO's, Calamity mitigation and enumeration- crop compensation - Crop Cutting Experiment and Crop Insurance - Revenue records of Farmers, Drones in Horticulture crop production-AI based weather forecasting and farm advisory-GIS mapping- Major Research Institutes in Horticulture.

8. Mechanical Engineering

(Diploma Standard)

Code: 441

Unit I: Industrial Engineering and Management (25 Questions)

Selection of site – Plant layout – Plant maintenance – Plant safety – Work study – Method study – Work measurements – Functions of Production planning and control – Principles of Management – Personnel management – Fixing selling price of a product – Break even analysis – Make or buy decision – Depreciation methods – EOQ – Supply chain management – TQM tools – Control charts– ISO 9000 Series quality standards – QS 14000.

Unit II: Production Technology (25 Questions)

Foundry - patterns - special casting techniques - welding - hot and cold working – drawing, rolling and forging - powder metallurgy – Processing of plastics - lathe work - planner - shaper - slotter - drilling machine - milling machines - grinding machines - broaching - boring and jig boring - Gears manufacturing practice - Heat treatment and metal finishing - press work – Non conventional production processes – Semi automats – Automats.

Unit III: Electrical and Electronics Engineering (15 Questions)

Units, Ohm's law, Kirchoff's law, Faraday's law - D.C. Circuits, batteries - electro magnetism - single phase and three phase A.C. circuits - Induction motors – Servo motors Stepper motors – Diodes – resistors – capacitors – transistors – logic gates - PLC – Sensors.

Unit IV: Strength of Materials (25 Questions)

Properties of engineering materials– Mechanical testing – Simple stresses and strain – Elastic constants – Properties of sections (centroid, moment of inertia) – Thin cylinders – Theory of simple bending – Torsion and springs – Shear force and bending moment – Friction.

Unit V: Thermodynamics (15 Questions)

Systems – Basics – Thermodynamic laws – Properties – Processes – SFEE – Air compressors – Types – Intercooling – Turbines – Boilers – Steam properties – working principle of steam power plant - Main elements of a nuclear power plant – Modes of heat transfer – Psychrometric properties, Processes.

Unit VI: Heat Power Engineering (15 Questions)

Working principle and comparison of otto and diesel cycles - construction and working of two stroke and four stroke engines - Heat balance test on I.C. engine – Fuel supply systems of petrol and diesel engines – Ignition systems – Cooling systems – Lubrication systems – Refrigeration – Types – Factors affecting human comfort – Air conditioners – Types.

Unit VII: Fluid Mechanics and Machinery (15 Questions)

Fluid properties – Pressure measurements – Fluid flow – Flow through pipes – Reciprocating pumps – Centrifugal pumps – Hydraulic turbines – Components of hydraulic systems and pneumatic systems.

Unit VIII: Computer Integrated Manufacturing (25 Questions)

Computers – Construction – Types – MS Office – CAD – geometric modeling – wireframe, surface and solid modeling – graphic standards – CAM – group technology – part families – parts classification and coding – CAPP – types. CNC – components of CNC – ATC – CNC EDM. Part program – format – coordinate system – types of motion control – types of interpolation – G and M codes – sub program – canned cycles – FMS – AGV – Robotics – Rapid prototyping.

Unit IX: Design of Machine Elements (15 Questions)

Engineering materials – Types - Design of Joints and Fasteners – Design of shafts, keys and couplings – Design of bearings – Belt drives and gear drives.

Unit X: Metrology and Measurements (25 Questions)

Scope of metrology – Accuracy – Precision – Limits – Fits – Tolerance – Linear and angular measurements – Measuring instruments – Form measurements – Surface textures and lays – Comparators – Gauges – Measurement of mechanical parameters – Computer aided inspection – Measurement of force, power and flow.

9. Mining Engineering

(Diploma Standard)

Code: 346

Unit I: Mine Development (25 Questions)

History of mining – contribution of mining in the human civilization and national economy, Indian mineral resources and world status – role of mining engineers in industry - mode of entries – applicability and limitations comparison of opencast vs underground mining and drilling methods –selection of drilling methods – flushing methods – exploration and production drilling – drilling in underground workings – variable affecting the performance of drilling – single tube, double tube and wire-line tube core barrels. Shaft sinking, election of shaft sinking including special methods and drifting by difficult methods including road headers and tunnel boring machines. Types of explosives and initiating systems-properties.

Unit II: Mine Ventilations & Environmental (5 Questions)

Mine gases – detection – physiological effects and permissible levels, flame safety lamp, natural and mechanical ventilation - types of fans, their characteristics and fields of application, distribution of air current, ventilation devices, types of ventilation, computer based analysis of mine air distribution, auxiliary ventilation, installation of booster fans, ventilation surveys, continuous monitoring, mine fires - sampling & Interpretation of sample – spontaneous heating and firefighting, Mine explosions – types, causes and preventive measures, Methane drainage methods. Inundation in mines – dewatering of water logged areas, Burn side safety boring apparatus and water dams. Lighting in mines – methods, standards of lighting. Concept of ecosystem, biodiversity, green-house gasses – ozone depletion – air pollution and water pollution.

Unit III: Mining Geology (5 Questions)

Details of Earth, earth quakes, volcanoes; mineralogy, megascopic properties of minerals; geo-tectonics; structural Geology: Geological features like faults, folds, etc., Stratigraphy and geological time scale – Physiographic divisions of India; Economic Geology: Different Prospecting Techniques: Reconnaissance; principles and methods of prospecting – by pit, shaft, trench and boreholes; Coal and petroleum geology: origin of coal, coalfields of India, migration and accumulation of petroleum, distribution of oil fields in India.

Unit IV: Underground Mining Methods - Coal & Metal (15 Questions)

Classification of coal seams, Bord and Pillar method - development, panel system, bord & pillar depillaring, mechanized method of development & pillar extraction, stowing methods, longwall advancing and retreating methods, mechanized longwall, salvaging and relocation, thick seam mining by slicing, blasting gallery method – sub level caving - horizon mining, hydraulic mining, underground gasification of coal, concepts of metal mining: development and stoping – conventional and mechanized drivage, classifications of stoping methods - supported and un supported – different stoping methods.

Unit V: Mining Machinery (20 Questions)

Wire ropes – classification, selection, methods of deteriorate and their prevention, classification of mine transport systems – different types of rope haulages, haulage calculations, different types of conveyors including high-angle conveyors, locomotives & areal rope ways, mine pumps, selection of pumps, numerical problems on head, quantity, h.p of mine pumps, coal face machinery: like drills, power loaders, longwall face gate-roadway machinery – shearer, AFC, etc., flameproof, intrinsically safe apparatus and signalling winding, head gear, shaft fittings – guides, head gear pulleys, keps, detaching hooks, guides ropes, cage and skip winding, drum and friction winding, breaking in winding, mine cables.

Unit VI: Surface Mining (45 Questions)

Overburden removal and disposal, design of waste dumps, bench parameters, haul roads, selection of equipment, different types of opencast equipment like excavators, transport (rail, road, conveyors) and ancillary equipment – stackers, reclaimers, opencast mine layouts, different types of explosives used, drilling blasting in opencast mines, fly rocks, air over pressure, controlled blasting, drilling and blasting in granite quarries, reclamation & mine closure plan, failure of slopes and various controlling and stabilization methods, safety in opencast mines, exploitation of coal over developed coal pillars, in-pit crushing and conveying, high wall mining, introduction to hydraulicking, dredging, leaching, etc.

Unit VII: Mine Management, Legislation and General Safety (40 Questions)

Mine organizational structure, ownerships of industries, organization, risks and rewards, recruitment and training, network analysis, CPM-PERT, Mines Act 1952, Mines Rules 1955, Coal Mines and Metalliferous Mines Regulations, DGMS technical Circulars, Indian electricity rules applicable to mines, VTC and rescue rules.

Unit VIII: Rock Mechanics and Strata Control (10 Questions)

Definitions, stress analysis, stress distribution around underground openings, relation between vertical and lateral stresses -induced stresses due to mining - principal plane, principal stresses, stress-diagrams, normal and shear and stress analysis in 2D, stress distribution around a mine workings, narrow and wider openings - Mohr's circle- simple numerical problems on stress analysis - Mohr’s circle, physical & mechanical, properties of rocks and methods of determination, RMR, simple numerical problems for estimation of RQD, classification of roof rock based on RMR - tunnel quality index, rock behavior and stress measuring devices, theories of failure of rocks, mining subsidence, factors effecting subsidence, protective measures on surface and underground, supports, FER supports and supports during extraction, different types of powered supports.

Unit IX: Mine Surveying & Mineral Processing (5 Questions)

Linear measurements, compass surveying, true meridian, magnetic meridian open & closed traverse, traversing with compass and chain, permissible errors, leveling — contouring and subsidence surveying, theodolite — temporary and permanent adjustments, permissible error for surface and underground and their distributions, correlation survey: tachometry, dip, strike, fault problems, EDM, GPS —DGPS, total station, introduction to remote sensing. Comminution, crushers — types of crushers, working principles and operation, comparison of crushing and grinding, grinding mills, industrial sizing, screening and classifiers, industrial screens, concentration, objectives and classification methods - sink and float technique, tabling, jigging, froth flotation.

Unit X: Mine Planning and Design and Computer Applications in Mining (30 Questions)

Estimation of ore reserve based on bore hole data, design of mine openings, design of length of long wall face, design of opencast mines, optimum blast design, design of mine ventilation systems, pillar design problems, design of a pumping system for an u/g mine, design of support system in u/g mining, preparation of EMP of mines. Computer Engineering drawing principles, - Draw, Modify, Edit, View, Hatch, geometric constructions using CAD, drawing of simple geometrical shapes like circles, tangents, AutoCAD, Basic

concepts of mine planning of stratified deposits using software like MINEX, MPD, etc. and other MPD software.

10. Physical Education

(Diploma Standard)

Code: 354

Unit I: Principles and History of Physical Education (20 Questions)

Meaning of Physical Education, Physical Culture, Physical Training. Aim and Objectives of Physical Education. Physical Education in Ancient Greece – Sparta and Athens – Ancient and Modern Olympic Games – Asian Games. Physical Education in India – SAI, SDAT, School Level Competitions in Tamil Nadu. School games federation of India.

Unit II: Biological Foundations and Training Methods (20 Questions)

Biological foundation: Growth and Development – Heredity and Environment, Muscle tone, Athletic heart – Reciprocal innervations – Vital capacity – Chronological age –Physiological age – mental age. Types of Muscular Contractions. Periodisation in Training. Training Load and Components of Training Load Training methods: Types of Training - Weight training - Circuit training - Fartlek Training -Interval Training.

Unit III: Tests, Measurement and Evaluation (20 Questions)

Meaning of the terms: Test, Measurement, and Evaluation. Criteria for Evaluation: Validity, Reliability, Objectivity. JCR Motor Fitness test, Muscular Fitness : Kraus Weber Minimum Muscular Fitness Test, Newton Motor Ability Test, Cardio vascular test: Harvard step test, 12 minutes run/walk test. Badminton: Miller Wall Volley Test. Basketball: Johnson Basketball Test. Hockey: Friedel Field Hockey Test. Volleyball: Russel Lange Volleyball Test, Brady Volleyball Test. Football: MC-Donald Soccer Test.

Unit IV: Anatomy and Physiology (20 Questions)

Cell structure and properties, Tissues, Organs, Axial and appendicular Skelton. Classification of joints. Types of muscles. Blood, Composition of Blood, Blood groups, Functions of Blood. Structure and Functions of Heart, Structure and Functions of Lungs, Structure and function of Tongue, Teeth, and Ear. Central Nervous system- Brain - Spinal cord -Reflex action, Autonomous Nervous system Effects of exercise on the various systems of the body: Skeletal System, Muscular System, Circulatory System, Respiratory System.

Unit V: Health Education, Sports Injuries and Physiotherapy (20 Questions)

Meaning of Health Education – Health Services and Supervision – Nutrition and Diet, Components of Food. Infection immunity – Causes of Disease – Malaria, Small Pox, Dysentery, Mumps, Typhoid. Sports injuries – Meaning – Importance – Treatment for Shock, Poisoning, Drowning, Bleeding, Fractures, Sprain, Strain, Dislocation, Fainting, Abrasion, Dog bite, First Aid Box, Cuts – Kinds of Bandage, Sun stroke-General rule for burns – Snake Bite. Physiotherapy – Definition – importance of Physiotherapy, Principles of Physiotherapy – Electro therapy – Hydro therapy –Thermo therapy, Massage – Posture – Postural Deformities.

Unit VI: Sports Psychology and Fitness (20 Questions)

Meaning of Sports Psychology and its importance. Motor Learning and motor performance. Basic consideration in Motor fitness: Body build, Mental aspects, Sense Perception: Vision, Kinesthesis, Tactile. Emotional effects: Tension, Anxiety, Stress. Theories of learning: Conditioned Response – Trial and Error – insightful. Theories of Play. Physical fitness, Reaction time, Movement time, Types and Components of Physical fitness.

Unit VII: Yoga (20 Questions)

Meaning and Definition of Yoga. Eight limbs of yoga: Yama – Niyama – Asana – Pranayama- Pratyahara – Dharana – Dhyana – Samadhi. International Yoga Day. Suryanamaskar. Breathing exercises and Asanas towards Promotion of Physical, Mental and Emotional Health.

Unit VIII: Methods and Management in Physical Education (20 Questions)

Meaning and importance of methods in Physical Education- factors influencing methods. Presentation Techniques - Class Management - Teaching aids - various methods of Teaching - Types of Tournaments, Preparation of Fixtures for Knock out, League and Combination Tournaments. Intramurals and Extramural. Different levels of Organization schools, Colleges and Universities - Guiding principles of organization - Records and Registers - Construction and maintenance of Swimming pool and Gymnasium.

Unit IX: Rules of Games and Sports (20 Questions)

Ground marking maintenance, Equipments, Duties of Officials and Rule of sports and games: Basketball, Ball Badminton, Badminton, Cricket, Football, Handball, Hockey, Kabaddi, Kho-Kho, Tennis, Table Tennis, Volleyball.

Unit X: Track and Field (20 Questions)

Layout of standard track (400 meters), Method of calculating Staggers and Arch start. Relay zone marking for 4*100 and 4*400. Layout of Circle/Runway and sector for : Javelin, Shot-put, Discus, Hammer throw , Long Jump, Triple Jump and High Jump. Measurements of Standard Athletic Equipments.

11. Rubber Technology and Polymer Technology

(Diploma Standard)

Code: 576

Unit I: Fundamentals of Field latex (20 Questions)
Origin of Rubber – Seed collection – Rubber nursery – Types of clones – Plantation – Maintenance of plantation – Intercropping – Tapping – Preservation – Transportation.

Unit II: Conversion of Field latex and Cuplump (20 Questions)
Composition of latex - Bulking – Concentration and its methods – Coagulation - Conversion into Centrifuged latex, Skim latex, Sheets (Pale Latex Crepe, Ribbed Smoked Sheet and Estate Brown Crepe) – Grading - Packing.

Unit III: Polymer Chemistry (20 Questions)
Monomer – Polymer – Classification of polymers - Newtonian and non-Newtonian Fluids - Molecular weight and distribution - Molecular weight determination - Degree of Polymerisation - Polymerisation techniques - Glass transition temperature - Factor affecting glass transition temperature – Amorphous Vs Crystalline polymers – Factors affecting crystallinity.

Unit IV: Rubber Material (20 Questions)
Classification of Rubbers – Specific properties and applications of General purpose rubbers: Natural rubber, Isoprene rubber, Styrene Butadiene rubber, Butadiene rubber - Speciality rubbers: Nitrile rubber, Chloroprene rubber, Ethylene Propylene Diene rubber - High performance rubbers: Fluoro rubber (FKM), Silicone rubber, Polyurethane rubber.

Unit V: Plastic Material (20 Questions)
Classification of plastics - Thermoplastic Vs Thermoset – Specific properties and applications of Commodity plastics: Polyolefins, Polystyrene - Engineering plastics: Polycarbonate, Polymethylmethacrylate, Acrylonitrile Butadiene Styrene, Polyamide, Polyacetal - High performance

plastics: Poly Ether Ether Ketone (PEEK), Polyphenylene Sulphide, Polyphenylene Oxide - Thermoset plastics: Epoxy, Phenol Formaldehyde, Melamine Formaldehyde, Urea Formaldehyde, Unsaturated Polyester

Unit VI: Compounding Additives (20 Questions)
Peptizer – Activator – Fillers and its types – Processing aids – Antidegradants - Curing agents – Accelerators - Heat Stabilizers - Blowing agent – Retarder

Unit VII: Polymer Compounding (20 Questions)
Latex compounding - Preparation of dispersion, Emulsion and Solution – Polymer compounding - Two roll mill, Internal mixer – Banbury, Kneader, Sigma mixer – Ribbon blender.

Unit VIII: Processing and Product Manufacture (20 Questions)
Types of Moulding – Compression moulding – Injection moulding – Transfer moulding – Blow moulding – Rotational moulding – Calendaring – Extrusion.
Manufacture of Gloves, Contraceptives, Foam, Thread, Tyre and tubes, Hoses, Belts, Footware, Oil seal, Rubber rollers and Adhesive.

Unit IX: Testing and Quality Control (25 Questions)
Testing of latex – Total Alkalinity, Dry Rubber Content, Total Solid Content, Volatile Fatty Acid number, Mechanical Stability Time, KOH number, Viscosity – Testing of Polymers - Oscillating Disc Rheometer, Hardness, Tensile strength, Flexural strength, Tear strength, Compression Set, Abrasion resistance, Fatigue resistance, Environmental Stress Cracking resistance, Impact strength, Melt Flow Index, Flammability and Weathering test.

Unit X : Industrial Management and Safety (15 Questions)
Factory Act - Plantation Labour Act - Workman Compensation Act - Personal Protective Equipments - Fire Safety - Inventory Management – Pollution Management - Effluent treatment plant.

12. Trade - Advanced Computer Numerical Control Machining Technician

(ITI Standard)

Code: 534

Unit 1: General Safety Precaution and First Aid (10 Questions)

Importance of safety – Basic need of Personal Protective Equipment (PPE) – First Aid – Safe Disposal of used engine oil – Hazard identification – Safety signs for Danger Warning – Personal Safety – Fire Extinguishers.

Unit II: Perform Turning, Milling Operations (10 Questions)

Lathe – Types - Parts of the Lathe – Work holding devices – Types of Holder – Cutting tools used for different operations – Performing Face turning – Taper turning – Grooving – Threading Knurling – Drilling – Boring – Jig and fixtures – Coolant - Milling – Work piece setup on Milling Machine – Loading and unloading of cutting tools – Basic operations Step milling, Slot milling, Angle milling etc.,

Unit III: Product specification and interpret industrial engineering drawing and quality of surface (40 Questions)

Product design and Development – Prepare check List of customer needs - Customer needs & select optimum requirement - Develop product specification report - Symbols used in industrial drawing - Create a checklist of dimensions & customer specific requirements - Geometric dimension - Tolerances - Symbol - Fundamentals of limits fits & tolerances & Symbols – Interchangeability Importance of multi stage drawing - Surface finish and it's importance - Post process manufacturing operation – International standard & symbols used to represent surface finish and calculation – Process flow diagram - Measuring instruments – Vernier Caliper – Micrometer – Gauges and Properties.

Unit IV: Introduction CNC Machines (40 Questions)

G Code and M Code and various cycle end code - Importance of Emergency stop function key Tool offset with the help of jog mode - Program in MDI mode, single block option - Edit – Auto - MPG mode – Create, execute and verify GOO,GO1 program - Linear interpolation & Rapid traverse - Orientation of machine movement - Identify the direction of machine movement by using Jog mode - Concept of tool travel with Linear interpolation - Orientation of machine movement – Absolute & Incremental – Circular interpolation Clock wise and Counter clock wise Create, simulate and execute - Concept of grooving, parting off and threading - Straight , taper and multi start - Internal profile using turning facing and pattern repeat cycles - Internal groove using canned cycles -Tool nose radius compensation – Calculation of threading parameters.

Unit V: CNC Turning (15 Questions)

Introduction to CNC Lathe machine – Concept of Numerical Control - Fanuc, Siemens, Mitsubishi, HAAS – CNC turning centre features & its components – Work Piece holding devices used in turning center– Create and run the program using sub routine codes - Concept of sub programming of block in CNC turning programming - Concept of axis & Coordinate system used in CNC turning Centre –Turret – Tail stock.

Unit VI: VMC Machines (15 Questions)

Introduction to VMC milling machine – Work Piece holding devices – Introduction Turn mill centre Dual spindle / Sub spindle – Create and run the program using sub routine codes - Tool holding devices used in VMC - Concept of sub programming - Concept of axis & Coordinate system used in CNC VMC Centre – Tool wear offset –Tool Magazine – Automatic Tool Changer– Concept of interpolation and Canned Cycles.

Unit VII: Routine Maintenance and Trouble Shooting of CNC LATHE & VMC (10 Questions)

Routine and Preventive maintenance & basic troubleshooting of CNC lathe and routine maintenance & basic troubleshooting of CNC VMC - Perform maintenance OEM recommendations.

Unit VIII: VMC G Code and M Code Programming (30 Questions)

Introduction to Vertical Machining Centre – Concept of axis & Coordinate System – Concept of speed, feed & Machining depth of cut - Identifying & replacing of cutting tools – Concept of tool wear & offset – Concept of over travel limits in VMC Machines – Importance Emergency stop function key – Concept of VMC mode like Jog, MDI, Edit, Auto, Single Block, MPG – VMC Machine movement on various G codes & M Codes – Create, execute and verify GOO,GO1 program - Linear interpolation & Rapid Traverse to verify Absolute Programming & Incremental Programming – Circular interpolation Clock wise - Circular interpolation Counter Clock Wise – Work offset – Tool offset – Dry run the program for verifying actual tool path – Cycle time calculation – Polygonal Milling with Polar Co-ordinates – Scaling, Mirroring & Rotation on VMC Concept of Importing and Exporting of VMC program.

Unit IX: Computer Aided Machining (20 Questions)

Computer aided machining – Geometry Creation – Surface – 3D Solid Modelling – Computer Aided manufacturing software - Generate and export NC program for machining - Generation of complex machining part program with the help of CAM software - Concept of Tool Path Verifications on CNC machines – Create Simulate & Execute a complex machining part program Create Tool path using CAM software & Verify with the help of graphical icon on CNC machines.

Unit X: 4th Axis on VMC (10 Questions)

Auxillary axis - Concept of Rotary axis - indexer & its importance - Concept 4 Axis Machining (step wise and continuous) - Referencing of 4th axis - Align 4th axis on machine.

13. Trade - Architectural Draughtsman

(ITI Standard)

Code: 531

Unit I: Familiarization with engineering drawing (15 Questions)

Familiarization with engineering drawing, tools and equipment, Architectural signs and symbols and their uses in the drawings, Sketching techniques**-**Elements of drafting, Read, Ability, clarity, accuracy and neatness, Pencil grades, Method of pencil uses, Uses of different brush, Strokes Various types of lines used for sketching, Solids – Definition of solids, Types of projections - Types of projections Projection planes First angle projection, Third angle projection, Isometric view-Isometric view of geometrical solids.

Unit II: Construction (25 Questions)

Brick masonry**-**Technical terms, Principle of brick masonry, Different types of bonds and their uses in construction, Types of Bricks, Stone masonry - Technical terms, Principles of stone masonry, types of Stone masonry, Composite masonry, Foundation-Purpose, Causes of failure of Foundation, Types, Carpentry Joints - Technical terms, Classification of Carpentry Joints, Uses Doors - Standard Sizes of doors, Types of doors, special doors. Windows - Standard Sizes of windows, Types of window, special windows, Lintels - Purpose of lintel ,Types and uses of lintels, Chajjas, Arches **-** Technical terms, Materials used for construction of arches, Types, Stairs - Technical terms, Requirements of good stairs, Types of Stairs & Material used for Stairs, Floors and flooring **–** Components of floor , floor covering, construction of ground floor, Floor coverings, Ground and basement floor,**–** Definition, Sources of dampness, Prevention methods of dampness , Materials used in DPC, DPC Treatment in Building, Anti-termite treatment -Types of Anti termite treatment, Roof Covering Damp proof Course (DPC) – Technical terms Classification of Roofs, Roof Covering Materials, Expansion joints in construction, materials used for expansion joint.

Unit III: Auto CAD & Model Space view Port in Auto CAD (20 Questions)

Definition, Auto CAD, CAD Hardware, Software, Key Board function, Graphical User Interface, Method of Installation, Basic Commands-I, & II, Other CAD commands, Basics CAD, Shortcut Keys.

Model space view Port-Benefits and types of Auto CAD view Ports, Create Model space view port in Auto CAD, Create Layout view Port in Auto CAD, Rotate view port in Auto CAD, Lock the layout view port in Auto CAD.

Unit IV: History of Architecture (15 Questions)

Indian architecture - Stupas and Typical Buddhist column, Northern Indian style elements and characteristic features, Egyptian architecture -Characteristic features of Egyptian architecture Tombs mastaba pyramid – the great pyramid at cheops at giza, the great sphinx of chephren. Greek architecture-Greek columns like doric order, ionic order, corianthan order Characteristic features of the temple of Parthenon at Athens, Olympia stadium at athens. Roman architecture - Characteristic features of the temples of Saturn at rome, the pantheon at Athens, basilica of Trajanat rome.

Unit V: Reading and Interpretation of Structural Drawing & Sketchup Software (20 Questions)

Reading and Interpretation of structural drawing, One way slab, two way slab. Single reinforced beam, Double reinforced beam, Column foundation, Staircase Waist slab.

Sketchup software - Benefits of 3D modelling Architecture include, 3D modelling in Sketchup, Sketchup Hardware and Software, Installation instruction for window, Getting started, Navigation 3D, Tool box description, creating basic shapes, Creating and placing basic text, Grouping and components, 3D Modelling in Auto CAD, Solid Modelling, Surface Modelling, Mesh Modelling.

Unit VI: Working Drawing (10 Questions)

Definition, Working Drawing, Types of working drawing, Components of working drawing, Importance and benefits of Working Drawing in construction, Working Drawing standard and conventions, Architectural Drawing, Structural Drawing, Electrical Drawing, Plumbing Drawing, Landscape Drawing.

Unit VII: Case study, Anthropometry & Ergonomics (15 Questions)

Case Study - Style of Architecture, Construction Technologies and Materials.

Anthropometry & Ergonomics - Principles and practice of Anthropometrics, Anthropometrics and Ergonomics in building design, Measurements of human abilities and limitations.

Unit VIII: Climate Responsive Deigns (15 Questions)

Study of climates in India, Sun path diagram and orientation of building with respect to the climate, Positioning of windows and open spaces as per climatic need, Fundamental of climate responsive planning Passive solar design.

Unit IX: Revit Software (25 Questions)

Revit Architecture - Key features of Revit software, Work flow in Revit, Building information modelling (BIM), Some key terms in BIM, Bidirectional Associatively, System requirements for Revit 2023, To Launch Revit Architecture and select template, User interface, Building elements, Build - Build, Project Unit, Length format dialog box, Assign different parameters to the Basic walls, Assign material to an elements, Graphics, Surface Pattern, Assign Background, Surface pattern, Set appearance of material, Draw Tool bar create walls, Make changes in temporary dimension, Doors and Windows - Apply doors in a wall, Parameters, Modify - Modify models by using modify tools, Roof by footprint, Create floor components column in plan, Room & Area - Compute area & volume of rooms and other parts of building, Apply tags by tag room, Compute, Gross building Area and Rentable area, Assign colour scheme to the different parts of building, Create stairs by run, Stair by sketch ramp, Railing, Dimension to the model, Edit Dimension, Write text, Apply tags and symbols in a floor plan, Apply different style of hatch pattern to the selected design, Site planning and Tops Surface, Develop Site in Revit Architecture, Elevation, Section & 3 D section create elevations and section view in revit.

Unit X: Green Architecture (40 Questions)

Green Building **-** Definition, Green building and its importance, Benefits concept, Fundamental principles, Material used in construction and Resources, Sustainable Architecture, Passive Solar home plan, Ecological Resources, Study of IGBC rated building in India, Concept and spatial design, Case study, Concept, materials and Resources, Building Automation, Innovation, Green building rating system, Energy conservation in Green Architecture, Sustainable site selection for green building, Process of green building, Rating system, Eco-house at Findhorn, Eco village with Turf roof, Rating process, GRIHA evaluation process, LEED - Strategies and certifications of LEED types, LEED score system, Sustainable sites, Development density, Glossary water sense labled products, Equipment and System, Construction IAQ management plan.

14. Trade - Basic Designer and Virtual Verifier

(ITI Standard)

Code: 532

Unit I: General Safety Precaution (10 Questions)

General Precaution and First aid- 5S Concept (Kaizen) – Occupational – Health and Safety – Knowledge of Design Frame Work and Product Development – Personal Protective Equipment (PPES).

Unit II: Apply Engineering drawing in Computer Aided Design (CAD) / Computer Aided Engineering (CAE) Software (20 Questions)

CAE –Design Steps in CAE - Testing and Analysis in the CAE – Selection of Materials for the Designed Product – Engineering Drawing to Learn Point, Line, Plane, Projection, 2D and 3D Drawing using CAE – CATIA and General Operations in it (Point, Line, Arc, Ellipse, Trim, Offset, Fillet, Chamfer, etc.,) – Move, Copy, Array Command – 3D Concept Modelling Tools – Importing CAD Model – Computer Aided Three Dimensional Interactive Application (CATIA) V5 (2022) Software.

Unit III: Sheet Metal Design and Essential Assembly Components (10 Questions)

Design of Sheet Metal Parts in CATIA – Geometric parameterization – Sheet Metal Design – Assembly Importing – 2D Drawings – (Bill of Material) BOM – Exploded views in CATIA.

Unit IV: Finite Element Method (FEM), Computer Aided Engineering (CAE) Software (Ansys 2022) (15 Questions)

Computer Aided Drawing (CAD) and Finite Element Method (FEM) Capabilities of Computer Aided Engineering (CAE) Software – Familiarization of Graphical User Interface (GUI) of Computer Aided Engineering (CAE) Software – Familiarization with Geometry – Finite elements Modules – Various Type of Materials, Properties and Elements – Discretization.

Unit V: Finite Element Method (FEM) Models Components, Meshing, 1D, 2D, 3D Elements, Element Quality (Ansys 2022) (20 Questions)

Concept of Meshing – Types of Mesh – Material Selection – Geometry Quality Parameter – Checking the Integrity – Creating the Mesh Using 1D, 2D, 3D Elements – Introduction to Various Types of Available 3D Elements.

Unit VI: Simple Analysis by Applying Appropriate Loads and Boundary Conditions (Linear Static Analysis) (Ansys 2022) (25 Questions)

Apply the Appropriate Loads and Boundary Conditions – Preparation of the Finite Element Model (FEM) for Analysis- Submit the Finite Element Model (FEM) to Solve – Checking the Correctness of the Analysis – Post Processing of result – Interpretation of the Analysis.

Unit VII: Analyze by Inertial Relief Method, Non-linear Analysis, Modal Analysis, and it's Components (Ansys 2022) (25 Questions)

Linear Static Analysis – Inertial Relief Method – Analyzing the Components – Non-linearity – Need for Modal Analysis – Concept and Equation of Natural Frequency- Concept of Mass, Stiffness, Resonance, Rigid Body Modes – Difference between rigid body Modes and Local Modes.

Unit VIII: Basic Thermal Analysis (25 Questions)

Heat Transfer Analysis and it's Requirements – Symbols and Mathematical Expression for Conduction, Convection and Radiation – Basic Requirements of Heat Transfer Analysis – Material Data and Physical data Collection to check the Condition of Heat Transfer – Study the Output of Analysis in Ansys.

Unit IX: Frequency response Analysis of Beam and any Suspension Components (25 Questions)

Advanced Analysis – Introduction to Dynamic Loading – Dynamic Stiffness – Frequency Response Analysis – Sinusoidal Frequencies – Introduction of Time Dependent loading – Sinusoidal load – Impulse Load in Ansys.

Unit X: Thermo Mechanical Analysis of Engine Components, Welded Joints (25 Questions)

Thermo Mechanical Analysis – Any Loading type is Converted applied on the Component as a Mechanical load along with Thermal loads and Analysis in Ansys.

15. Trade - Computer Hardware and Network Maintenance

(ITI Standard)

Code: 533

Unit I: Safety and Electronic Components and Switch Mode Power Supply (15 Questions)

First Aid, Electrical Safety:

Electronics Basics:

Semiconductor Devices - DIAC, Silicon Controlled Rectifier (SCR), TRIAC – Differential Amplifiers, Operational Amplifiers (OP - Amp) working principle, specifications, applications - characteristics, advantages. Integrated Circuit- oscillators - Integrated Circuit 555-linear Integrated Circuit - Voltage regulator - Zener diode, principles application, limitations. Shunt and series regulators, applications, limitation - Integrated Circuit voltage regulators - Fixed/variable, specifications - Comparison of linear and Switch mode power supplies - Working of Switched Mode Power Supply (SMPS), Types, specifications and its applications. Tracing of Switched Mode Power Supply (SMPS) circuits - Trouble shooting of SMPS with emphasis on the knowledge of power supplies in Personal Computer (PCs) and its Input / Output devices. Use of SMPS and its advantages and Disadvantages.

Unit II: Introduction to Computer Hardware and Parts (25 Questions)

Computer Generations-Classifications - (Like Analog and Digital)

Computer components like Cabinet and internal Parts (in connection to Desk top computers)-Hand tools needed to dismantle the computers for repairing. Cards inside the computers like mother board and daughter boards and auxiliary boards – Cables used inside the computer (Desk top and laptop) to interconnect the other devices.

Personal Computer Hardware: Peripheral Devices and its specifications - Make etc. Ports of Computers and its uses-Merits of various new Port like USB, USB3.0 etc. Post Error Debug Card.

Processors: Leading Processor Manufactures, Specifications of processors (Intel Celeron, P4family, Xeon dual core, quad core, core2 duo, i3, i5, i7 and AMD) – 4 bit, 8 bit, 16 bits, 32 bit architectures.

Memory: Bit, Nibble, Bytes, kB, MB, GB values: Internal and External, Semiconductor Memories devices, Semiconductor memories RAM, ROM, PROM, EPROM, EEPROM, Static and dynamic Memories. Hard Disk Drives (HDD) - Concepts of Sector, Track, Cylinder. Floppy Disk Drives (FDD) - Size, storage capacity - Write protect - Read/Write Head, Spindles. HDD and FDD sizes, New Generation HDDs. HDD interface like IDE (Integrated Drive Electronics) cable.

Unit III: Computer Hardware Preventive Maintenance (20 Questions)

RTC, POST, BIOS, CMOS, UEFI - BIOS and UEFI Security - Watt and Voltage - Power Fluctuation Types.

Power Protection Devices - CPU Architecture - Enhance CPU Operations - Multicore Processors - CPU Cooling Mechanism - Concept of RAID - RAID Levels - Legacy Ports - Video and Graphics Ports - USB Cables and Connectors. SATA – e SATA Cables and Connectors - Twisted Pair Cables and Connectors - Coax Cables and Connectors - SCSI and IDE - Monitor Characteristics - Monitor Terms and Display standards - Using Multiple Monitor - Thick and Thin clients – NAS (Net Work Attached Storage) - Safe Disposal.

Maintenance of the internal components and necessary hand tools used for the same.

Unit IV: Operating System Installation and Features System Utilities (35 Questions)

Hard Disks Operations - Hard drive Motherboard - Desktop Hard Drive Buyer's Guide - Multiple Hard Drives for Performance and Reliability - Partitioning a hard disk (primary and extended - partitions) - Bad

Sectors in Hard disk - Master Boot Record, in - place installation, Registry fixing, performance level check, Shortcut fixing, Fixing Start - up process, log, difference between MBR and GPT - Types of software. System software - OS, Compiler. Installation of Application software-like MS office. High - level, low - level language.

Properties of connected devices. Applications under windows accessories - Finding files, folders, computers. Control panel. Installed devices and properties Updating of OS, Different configurations of Computer system and its peripherals, Compatible with different hardware/software. Pre - installation Prerequisites, Install procedure, Rollback or Un-install procedure, Tests of various device driver software.

Version of a software, Service pack, Software Installation – Post - installation – Backup procedure and specifications, Restore procedure, Periodical - Reliable sources of downloading software, antivirus - Basic Linux commands - Linux file system, The Shell, Users and fill permissions, vi -editor, X window system, Filter Commands, Processes - Shell Scripting - Concept of UNIX.

Functions of an operating system - Disk operating system (DOS) - Concept of GUI (Graphical User Interface), Modes of starting on different occasions - Desktop, Icon, selecting, choosing, drag and drop - My computer network places - Recycle bin, task bar, start menu, tool bar, and menus - Window Explorer - Properties of files and folders.

Users and user account - Types of user accounts, user access levels - Privileges, types of privileges, various scope, permissions, permission parameters, user and group permission, time - based permission, expiration of permission.

Junk files, deleted files, un deleting files, configuration of internet browser - Maintenance of Temp folder internet history, cookies, bookmark, Concepts of Storage Area Network (SAN), NAS and cloud storage.

Add and use contacts, Calendar basics, Recall and replace sent messages, Send automatic replies - The ins and outs of BCC, Use Instant Search to find Calendar items, Add holidays to your calendar, Create or delete a search folder, Import and export v Cards to Outlook contacts, Outlook, Reach out with contact groups, Send or delete an email stuck in your outbox, Take calendars to the next level, Track email with read receipts, Password protect your mailbox.

Unit V: Laptop and its Internal Hardware Components (10 Questions)

Introduction of laptop - Comparison of various Laptops - Block diagram of laptop and description of all its sections - Study of parts of a laptop - Input system: Touchpad, Track ball, Track point, docking station, Upgrade memory, hard disk, replacing battery - Configuring wireless internet in a laptop - Latest Tools and Gadgets for Desktop/Laptop Repairs.

Unit VI: MS-Office Package Installation & Printer, Scanner Drivers Installation (25 Questions)

Word Processing (using MS - Word): Feature like Creating and saving document files - Formatting text and editing - Setting page and margins - Tabs and indents. Creating multicolumn documents. Inserting pictures in documents.

Ms – Excel - Spreadsheet Software: Creating Worksheets using Spreadsheet Software - Formatting cells. Using formula in cells. Graphs and tables. Advanced features.

Ms - Power Point Presentation: Creating Slide Shows - Fine tuning the presentation

Printers: Dot Matrix, Laser, Inkjet, Line Printer Working – Front panel controls - Advantages of them over each other - Printer Drivers and its necessity - Plotters and its usages and operation.

Scanners and Printers: Scanner, Barcode Scanner, Network Scanner - Multifunction Printer, Passbook printer, High Speed Printer, Line Printer, Network Printer concepts and operations.

Unit VII: Network Components and Internet (20 Questions)

Networks Advantage, Peer – to - Peer and Client/Server Network - Network Topologies – Star, Ring, Bus, Tree, Mesh, Hybrid - Type of Networks – Local Area Networks (LAN), Metropolitan Area Networks (MAN), Personal Area Network (PAN), Controller Area Network (CAN), Wide Area Networks (WAN). Internet, Ethernet, Wi-Fi, Bluetooth, Mobile Networking, Wire and wireless Networking. Difference between Intranet and Internet - Extranet, 3G, 4G, 5G.

Analog and Digital Signals: Simplex, Half-Duplex and Full-Duplex transmission mode - The functions of different layers in Open System Interconnection Model (OSI) – Protocols - Transmission Control Protocol / Internet Protocol (TCP/IP) model, File Transfer Protocol (FTP), Telnet and Subnet Mask - Wireless networking.

Network Components - Modems, Firewall, Hubs, Bridges, Routers, Gateways, Repeaters, Transceivers, Switches, Access point, Types, functions, advantages and applications - Layer 2 and 3 manage switch configuration - VLAN (Virtual LAN) Basic and configurations.

Network simulation software and use - Simple Mail Transfer Protocol (SMTP) - Hyper Text Transfer Protocol (HTTP) – Simple Network Management Protocol (SNMP) - DAP (Lightweight Directory Access Protocol) – Network Security - Dynamic Host Control Protocol - Architecture of Internet. DNS Server.

Internet Access – Internet Service Provider (ISPs) and examples (Broadband, Dialup, Wi-fi) - Virus and its Protection using Anti Virus, UTM (Unified Threat Management) and Firewall – Service Set Identifier (SSID) – wireless controllers – Software Defined Wide Area Network (SD WAN) – Proxy Server - Features of Proxy Server.

Unit VIII: Network Security Protection, Device Control (20 Questions)

Collaborating using wired and wireless networks, Protecting a Network - Remote desktop software like NetMeeting, Remote management of devices - Audit process of a switch/router/APs etc. - Surveillance using network devices – Network, LAN, Wi-fi Security – Aadhar based authentication.

Unit IX: Window, Linux Server (15 Questions)

Server concepts, installation step, configuration of server - Active Directory and Domain Name System (DNS) – Dynamic Host Configuration Protocol (DHCP), Routing and remote access – Editing /etc/hosts file - DHCP, DNS, WEB SERVER (Apache), SAMBA - virtual server and containers, cloud computing.

Unit X: Internet Web Browser Cloud Computing (15 Questions)

World Wide Web (WWW), website Web Browsing - Search Engines, Popular Search engines - Favourites Folder - Electronic Mail – e Mail Addressing, Blind Carbon Copy (BCC) and Carbon Copy (CC), Inbox, Outbox, Address book, SPAM - Cyber Security – Cyber Laws and IT Act - Cloud Computing and Virtualization - Server Virtualization, Client-Side Virtualization, Advantages of Server Virtualization – Hypervisors.

Type 1, 2 - Virtual Machine - Cloud Computing Characteristics.

16. Trade – Diesel Mechanic

(ITI Standard)

Code: 521

Unit I: Safety Workshop Practice & First Aid, Measuring & Marking Tool (20 Questions)

Importance of Safety and general Precautions to be observed in the work shop, Elementary of First Aid, Occupational Safety, Hazards Health, Fire Extinguisher, House Keeping & 5S Method - Safety disposal of

Used engine oil, Electrical safety tips, Safe handling of Fuel Spillage, Safe disposal of toxic dust - Safe handling and Periodic testing of lifting equipment - Hand Tools - Marking Materials - Chalk, Prussian blue - Cleaning Tools – Scraper, wire brush, Emery paper – Marking Tools - Surface plates – Measuring Tools - Steel rule, measuring tape, try square, Callipers-inside and outside, Dividers, surface gauges, Scriber Punches, Types of Punches - prick punch, centre punch, pin punch, hollow punch, number and letter punch – Chisel - flat, cross-cut – Hammer - ballpein, lump, Mallet, Types of Screwdrivers, Allen & key bench vice & C-clamps, Spanners, Types of spanners, Universal adjustable spanner, open end spanner, Sockets & accessories, Types of Pliers, Air impact wrench, air ratchet, wrenches-Torque wrenches, pipe wrenches, Pipe flaring & cutting tool, Pullers-Gear and bearing - Description, Least Count calculation, care & use of micrometer, Outside and depth micrometer, Inside Micrometer, Vernier calliper and its adjustments, Telescope gauges, Dial bore gauges, Dial indicators - Straight edge, feeler gauge - Thread pitch gauge - Vacuum gauge and tyre pressure gauge.

Unit II: Fastening & Fitting, Hydraulics & Pneumatics (15 Questions)

Different types of metal joints - Permanent, Temporary - Methods of Soldering – Screws - Different types of Screws - Nuts, studs & bolts – Locking device - Locknuts, cotter, split pins, keys, circlips - Lock rings - Lock washers – Gaskets, Gasket material - Type of Gaskets - Paper, multi-layered metallic, liquid rubber, copper and printed – Thread Sealants – Various type, locking, sealing, temperature resistance, anti-locking, lubricating – Cutting tools, Different type of cutting tools, Hacksaw – File - Parts of file, specification, Grade, Shape - Grinding Machine – Drilling Machine, types of drilling machine, Bench, Portable, electrical - Drill holding devices, work holding devices, drill bits – Taps and Dies, Hand taps and wrenches, calculation of tap drill sizes for metric and inch-taps, different type of die and die stock, Screw extractors –Hand Reamers, Different type of hand reamers - Lapping, lapping abrasives, type of laps – Hydraulics and pneumatics – Description, symbols and application in automobile of Gear pump, Internal & External, single acting, double acting & double ended cylinder - Directional control, Pressure relief valve, Non return valve, Flow control valve used in automobile.

Unit III: Basic Electrical & Electronics (15 Questions)

Basic electricity - Electricity principles - Ground connections - Ohm’s law - Voltage, current, resistances, Power, Energy - voltmeter, ammeter, ohmmeter, multi meter - Conductors & insulators – Wires – Shielding - Length vs resistance - Resistor ratings – Fuses & circuit breakers - Ballast resistor - Stripping wire insulation - Cable colour codes and sizes - Resistors in series circuits, Parallel circuits and series parallel circuits – Battery - types of battery, Lead acid batteries & Stay Maintenance Free (SMF) batteries – Chemical effect, Magnetic effects, Heating effects - Thermo-electric energy - Thermistors, Thermo-couples – Electrochemical energy - Photo-voltaic energy - Piezo-electric energy - Electromagnetic induction – Relays, solenoids, Primary & Secondary windings – Transformers - Stator and rotor coils.

Unit IV: Vehicle Specification, Service Station Equipments, Engine Classification Dash Board Gauges (20 Questions)

Classification of vehicles on the basis of load as per central motor vehicle rule, wheels, final drive and fuel used, axles, position of engine and steering - Transmission, body and load, Brief description – Uses of vehicle hoists, Two post and four post hoist, Engine hoists, Jacks, Stands – Introduction to Engine – Define of internal & external combustion engines, Classification of IC engines, Principle & Working of 2 & 4-stroke diesel engine Compression ignition Engine (C.I) – Principle of spark ignition Engine (SI), differentiate between 2-stroke and 4-stroke, C.I engine and S.I engine – Main parts of IC Engine – Direct injection and indirect injection, Technical terms used in engine, Engine specification – Study of various gauges / instrument on a dash board of a vehicle – Speedometer, Tachometer, Odometer and Fuel gauge and indicators - Gearshift position, Seat belt warning light, Parking-brake-engagement warning light and an engine -Malfunction light.

Unit V: Engine Constructional details (30 Questions)

Description and Constructional feature of Cylinder head, Importance of Cylinder head design - Type of Diesel combustion chambers - Effect on size of Intake & exhaust passages, Head gaskets Importance of Turbulence Valves & Valve Actuating Mechanism - Description and Function of Engine Valves, different types, materials, - Type of valve operating mechanism, Importance of Valve seats, Valve seats, inserts in cylinder heads - Importance of Valve rotation, Valve stem oil seals, size of Intake valves, Valve trains, Valve - Timing diagram - Concept of Variable valve timing - Description of Camshafts & drives Description of Overhead camshaft (SOHC and DOHC) - Importance of Cam lobes, Timing belts & chains, Timing belts & tensioners Description & functions of different types of pistons, piston rings and piston pins and materials - Used recommended clearances for the rings and its necessity precautions while fitting rings, common troubles and remedy - Compression ratio - Description & function of connecting rod - Importance of big - End split obliquely - Materials used for connecting rods big end & main bearings. Shells piston pins and locking methods of piston pins - Description and function of Crank shaft, camshaft - Engine bearings-classification and location – materials used & composition of bearing materials- Shell bearing and their advantages - Special bearings material for diesel engine application - Bearing failure & its causes-care & maintenance - Crank-shaft balancing - Firing order of the engine - Description and function of the fly wheel and vibration damper - Crank case & oil pump - Gears timing mark - Chain sprockets, chain tensioner - Function of clutch & coupling units attached to flywheel - Description of Cylinder block - Cylinder block construction - Different type of Cylinder sleeves (liner).

Unit VI: Cooling & Lubrication System (25 Questions)

Heat transfer method - Boiling point & pressure - Centrifugal force - Vehicle coolant properties and recommended change of interval - Different type of cooling systems, Basic cooling system components - Radiator, Coolant hoses - Water pump - Cooling system thermostat - Cooling fans - Temperature indicators - Radiator pressure cap - Recovery system - Thermo- switch Need for lubrication system - Functions of oil, Viscosity and its grade as per SAE - Oil additives, Synthetic oils, The lubrication system, Splash system - Pressure system - Corrosion/noise reduction in the lubrication system - Lubrication system components - Description and function of Sump, Oil collection pan, Oil tank, Pickup tube, different type of Oil pump & Oil filters Oil pressure relief valve, Spurt holes & galleries, Oil indicators, Oil cooler.

Unit VII: Intake & Exhaust System (20 Questions)

Intake & exhaust systems– Description of Diesel induction & Exhaust systems Description & function of air compressor, exhauster - Super charger – Intercoolers - Turbo charger - Variable turbo charger mechanism - Intake system components - Description and function of Air cleaners, Different type air cleaner, Description of Intake manifolds and material - Exhaust system components - Description and function of Exhaust manifold, Exhaust pipe, Extractors, Mufflers - Reactive, absorptive, Combination of Catalytic converters - Flexible connections, Ceramic coatings, Back- pressure - Electronic mufflers

Unit VIII: Diesel Engine Fuel System (20 Questions)

Fuel Feed System in IC Engine (Petrol & Diesel) - Gravity feed system, Forced feed system, main parts, Fuel Pumps - Mechanical & Electrical - Feed Pumps - Knowledge about function, working & types of Carburettor Diesel Fuel Systems - Description and function of Diesel fuel injection, fuel characteristics - Concept of Quiet diesel technology & Clean diesel technology Diesel fuel system components - Description and function of Diesel tanks & lines - Diesel fuel filters - water separator - Lift pump - Plunger pump, Priming pump - Inline injection pump, Distributor-type injection pump, Diesel injectors, Glow plugs, Cummins & Detroit Diesel injection - Electronic Diesel control - Electronic Diesel control systems, Common Rail Diesel Injection (CRDI) system, hydraulically actuated electronically controlled unit injector (HEUI) diesel injection system. Sensors, actuators and ECU (Electronic Control Unit) used in Diesel Engines.

Unit IX: Charging, Starting System and Emission Control (20 Questions)

AC & DC Generators - Constructional details of Alternator and starter Motors - Charging Circuit, Operation of Alternator and starter motor – Regulator unit - Ignition Warning Lamp, Solenoid switches –

Environmental & Eco-system, Vehicle Emission, Standard – Euro & Bharat Standards - Euro and Bharat II, III, IV, VI Sources of emission, Combustion, Combustion chamber design, Types of Emission, Characteristics & Effect of hydrocarbons in exhaust gases, Evaporation Emission Control, Carbon Monoxide & Carbon dioxide, crankcase emission control, Exhaust Gas recirculation valve - Controlling air fuel ratio, Charcoal storage device, Diesel Particulate filter (DPF), Selective catalytic Reduction (SCR) - EGR VS SCR.

Unit X: Trouble Shooting (15 Questions)

Causes and remedy - Engine Not starting, Mechanical & Electrical causes - High fuel consumption, Engine overheating - Low power Generation - Excessive oil consumption – Low / high Engine oil Pressure, Engine Noise - Troubles and remedy in charging and starting system.

17. Trade: Draughtsman (Civil)

(ITI Standard)

Code: 388

Unit I: Basic Engineering Drawing (25 Questions)

Engineering Drawing:

State the importance of engineering drawing, State the areas of civil engineering drawing.

List of drawing instruments, equipments and materials to be used during training:

State instruments, equipments and materials, List out instruments, equipments and materials, State the standard as per 962-1987, To use different drawing instruments, equipments and materials, Follow precautions in the use of instruments, equipments and materials.

Layout of drawing Sheet:

State the system of layout of drawing sheet, List the different layout for designated drawing sheet Explain the title block.

Folding of drawing Sheet:

State the purpose of folding a drawing sheet, Explain the method of folding for drawing sheet

Unit II: Geometrical Construction (25 Questions)

Plane Geometrical construction:

Define the terms of most commonly used geometrical shapes

Types of Lines and Angles:

Define points and lines, State the classification of lines, State the different types of angles, Explain the method of measuring angles.

Triangles and their types:

Define triangles, Name the different types of triangles and state their properties.

Quadrilaterals and their properties:

Define a quadrilateral, Name the quadrilaterals, State the properties of quadrilaterals

Polygon and their properties:

Define Polygon, Name the Polygon in terms of the number of sides, State the properties of polygon.

Unit III: Chain Surveying (15 Questions)

Introduction - History and principles of chain survey and instrument & employed

Define surveying, Explain the classification of Surveying, Narrate different methods of measurements, Express the instruments used for chain surveying.

Introduction about chain survey instruments

State the construction and uses of the chain survey instruments

Testing of metric chain (20m/30m)

State the necessity of checking the chain, State the methods of testing, List out then errors in the chain, State the limits of error in chain, Explain the adjust the chain, State Indian optical square

Measurement of distance by chain and chaining

State chaining and chaining a line, State unfolding the chain, Describe the reading the chain, State folding the chain, Calculate the errors in chaining

Unit IV: Compass Surveying (35 Questions)

Identification and parts of instruments in compass survey:

State about traversing, State types of compass, Name the prismatic compass and construction, Construction of survey's compass

Determining the bearing of a given triangular plot of ABC and calculation of included angles:

Calculate angles from bearing, Calculate bearing from angles

Determining the bearing of a given pentagonal plot of ABCDE and calculation of included angles

Calculate angles from bearings for a closed traverse, Calculate bearing from angles for a closed traverse, Calculate bearing of a pentagon

Magnetic declination and local attraction

Define the dip of the Magnetic needles, State the magnetic declination and variations, Calculate true Bearing, State local attraction and its elimination, Explain about errors and limits, State the testing the prismatic compass

Unit V: Plane Table Surveying (10 Questions)

Instrument used in plane table surveying:

State plane tabling, Name the instruments and accessories used in plan tabling, State the construction and uses of instruments and accessories used in plan tabling, Explain about leveling, centering and orientation in plain tabling, Explain the methods of plain tabling

Resection method of plane table survey:

State the resection method of plane table survey

Unit VI: Levelling (5 Questions)

Types of levelling:

Name the various types of levelling, Explain simple levelling, Explain differential levelling, Complete the reduced levels of points.

Unit VII: Road Engineering-I: (5 Questions)

Introduction to road engineering:

Define road, Define highway engineering, Define necessity and characteristics of road

Technical term used in road engineering:
Define road and Total Station advantage, Define various terms used in road engineering, Describe the various advantages of road

Principle of road alignment:

Alignment of road, Express the principle of highway alignment, Explain the different survey required for alignment

Classification of roads:

Describe the different classification of roads

Unit VIII: Road Engineering II (5 Questions)

Road Margins:

Define road margin, Describe the element Total Station of road margin

Camber, super elevation, sight distance and gradient:

Define camber, Explain super elevation, sight distance and express gradient

Unit IX: Total Station (35 Questions)

Introduction to total station:

Get introduced to the Total station, Learn the evaluation of Total station from the convectional equipment Total Station, Explain the benefit of Total Station and uses of Total station

Types of total station:

Explain the advantages and disadvantages of Total station, Explain the types of Total Station, Explain the precautions to be taken while using Total Station

Measurement with total station:

Explain the equipment required for Total Station surveying, Explain the procedure of measurement with Total Station

Characteristics and features of total station:

Define the features of Total Station, State the characteristics of Total Station, Advantages and disadvantages of Total Station

Principle of EDM- Working need setting and measurement Total Station:

Define EDM, State the principle of EDM, Features of EDM

Setting and measurement Total Station:

Define distance measuring, State principal of EDM, State classification of EDM

Total station Prism- instrument error operation:

Explain Total Station prisms, Describe sources of error in EDM, EDM instrument operation, Uses of EDM

Electronic display and data recording:

Define electronic data recording, Explain field computers, Define recording module, Internal memories

Rectangular and Polar Co-ordinate system:

Illustrate rectangular and polar coordinates

Unit X: Global Positioning System (40 Questions)

Introduction of GPS:

Explain GPS coordinate system, Describe Geographic latitude and longitude, GPS equipment

Satellite and Conventional Geodetic system:

What is satellite system, Define Geodetic system

GPS coordinate system and component Total Station of GPS & System segment Total Station:

Explain GPS coordinate system, Describe Geographic Latitude and Longitude, Explain and describe component Total Station GPS receiver

GPS segment Total Station:

Define GPS segment

Principle of Operation of GPS and surveying with GPS:

State the Principle of Operation of GPS, Describe the role of transit in GPS

Remote sensing:

Explain Remote sensing, Distinguish between GPS, GIS and Total Station

GPS signal code - GPS basics:

Introduction to digital signal, Explain data acquisition system, Describe signal processing, Explain code an basics

18. Trade – Electrician

(ITI Standard)

Code: 438

Unit I: Safety Rules – Fundamental of Electricity (10 Questions)

Safety Rules, Hazards, Types of Fire Extinguishers, Personal Protective Equipments, Types of Wires and Joints. Soldering Methods, Ohm's Law – Simple Electrical Circuits and Problems. Kirchhoff's Law and its application – Under Ground Cables - Capacitor types Functions Grouping and uses.

Unit II: AC Circuits – Cells and Batteries – Wiring Installation (20 Questions)

AC Circuits – Power, Energy, Power Factor in AC Single Phase Circuits, Poly phase circuit, Cells and Batteries - Basic Wiring Practice, Wiring Installation and Earthing – Types - Testing a Domestic Wiring Installation – Location of Faults, Remedies. Industrial Wiring – Isolator, Switches, Fuses, Relays, Timers and Limit Switches – Types of Circuit Breakers.

Unit III: Illumination and Electrical Measuring Instruments (20 Questions)

Illumination – Construction Details of Various Lamps – Electrical Measuring Instruments and types - Ammeter, Voltmeter, Ohm Meter, Power Factor Meter, Frequency Meter, Multi meter, Watt Meter, Energy Meters (1 Phase and 3 Phase). Tong Tester (Clamp on Meter), Smart Meters, AutomaticMeter Reading - Supply Requirements.

Unit IV: Electrical Appliances (10 Questions)

Domestic Appliances – Concept of Neutral and Earth – Cooking Range, Induction Heater, Food Mixer – Automatic Electric Iron Box, Electric Geyser Wet Grinder, Washing Machine and Fans.

Unit V: Transformers (20 Questions)

Transformer – Principle, Classification, EMF Equation, Transformer Losses. Open Circuit Test, Short Circuit Test – Efficiency – Voltage Regulation. Parallel Operation of Single Phase and Three Phase Transformers – Methods of Cooling of Transformer – Necessity of Cooling - Transformer Oil and Testing – General Maintenance of three Phase Transformer.

Unit VI: DC Machines (30 Questions)

DC Generators – Principle of Operation – Construction – Parts – Types – Characteristics – Build up of emf – Application – Losses efficiency

DC Motors – Principle of Operation – Starters – DOR – Armature reaction – Commutation – Speed Control Methods – Applications – Winding lap and Wave – Losses and efficiency – Maintenance, Service and repair.

Unit VII: AC Machines (10 Questions)

Three Phase Induction Motors – Principle of Working – Construction – Parts – Types – Squirrel Cage Induction Motor – Slip ring Induction Motor – Characteristics – Slip Vs Torque – Type of Starters – Basic Contactor Circuit – Parts and Functions.

Single Phasing Prevention – Losses and efficiency – Methods of Speed Control – Windings– Types– Concentric/Distributed– Single/doublelayer winding and related terms – Maintenance Service and repair – Trouble Shooting.

Single Phase Induction Motors - Working Principle – Types – Construction – Parts – Starting & running Methods – Domestic and Industrial – Applications Maintenance and Trouble Shooting

Unit VIII: Synchronous Machine (20 Questions)

Alternators - Working Principle – Construction – Parts – Types – Relation between Poles, Speed and Frequency – Voltage Regulation – Losses and efficiency – Characteristics – Phase Sequence – Parallel Operation – Careand Maintenance.

Synchronous Motor – Working Principle – Power factor improvement.

Unit IX: Electronics (30 Questions)

Resistors – Colour Code, Types and Characteristics – Active and Passive Components Diodes – Rectifiers – Characteristics – Transistors, SCR, DIAC, TRIAC – Applications – Digital Electronics – Logic gates and Combinational Circuits – UPS and Invertors.

Unit X: Power Generation, Transmission and Distribution (30 Questions)

Types of Power Generation –Conventional and Non-Conventional Energy Sources – Solar and Wind Energy – Solar Panels – Transmission and Distribution Network – Line Insulators – Over Head Poles – Safety Precautions and IE Rules for Service Lines – Terms related to Distribution.

19. Trade - Electronics Mechanic

(ITI Standard)

Code: 535

Unit I: Safety and Workshop Practice (20 Questions)

Importance of safety precautions - Personal Protective Equipment (PPE), First Aid, Fire extinguishers, Basic hand tools, Electrical terms – Calibrate the measuring Instrument Meters, Test and Service the different Cells and Batteries, Measurement and Calibration of equipments, uses and features Controls, Functions of Oscilloscope - Operate the front panel controls of a digital storage oscilloscope - Capturing a single shot signal - Function generator using IC 8038 – Execution of Soldering / Desoldering and various switches.

Unit II: Active and Passive Components, Power Supply Circuits and Transistor (20 Questions)

Testing of various Electronic Components, Resistors - Ohm's Law - Kirchhoff's Laws - DC series circuit – Inductors – Capacitors – Magnetism – Relays - Time constant for RC circuit - R.C. Differentiator - R.L.C. Series and parallel circuit – Semiconductor diodes – Transformer – Rectifiers - Zener diodes - Regulated power supply and Construction and Testing of transistors – Oscillators - Clipper Circuit / Clamper circuits – Introduction of Switch Mode Power Supply (SMPS), Uninterrupted Power Supply (UPS) and INVERTER.

Unit III: Power Electronic Components and Basic Gates, Combinational Circuits, and Flip Flops (20 Questions)

Construction of different power electronic components like Field Effect Transistor (FET) and their types, Silicon Controlled Rectifier (SCR), Triode for Alternating Current (TRIAC), Diode for Alternating Current (DIAC), Uni-Junction Transistor (UJT), Metal Oxide Semiconductor Field Effect transistor (MOSFET), Insulator Gate Bipolar Transistor (IGBT) – Assembling, testing and troubleshoot various digital logic gates, Combinational Circuits – Half adder, Full adder - Testing of flip flops types - Multiplexers & Demultiplexers

Unit IV: Computer Hardware MS Office, OS and Networking (20 Questions)

Cable and Connectors – Installation, Configuration demonstration of basic blocks of computer - Hardware / Software - Switch mode power supply for PC - Hard disk drives - Different types of printers - Computer virus and protection - MS office application and its function – Internet / e-Mail - Computer network - Wi-Fi network – Study the library components available in the circuit simulation software.

Unit V: SMD Soldering and Desoldering, Surface Mount Technology (SMT) (20 Questions)

Identification, place the solder / desolder and test different Surface Mount Display (SMD) components - introduction of Surface Mount Technology (SMT), Programming Gate Array (PGA) packages, cold/continuity check of Printed Circuit Board (PCB), lose/dry solders, broken tracks on printed wiring assemblies - Rework on PCB – Necessity of protection devices Main Circuit Breaker (MCB), Earth leakage Circuit Breaker (ELCB) and Fuse - Testing of DC motor, Stepper motor.

Unit VI: Communication Electronics (20 Questions)

Assembling and Testing Commercial AM / FM receiver - Radio wave propagation - Types of modulation and demodulation - Types of radio receivers, Characteristics advantages and disadvantages - Introduction to AM, FM & PM, SSB-SC & DSB-SC - Block diagram of AM and FM transmitter - FM generation & detection - Digital modulation and de multiplexing techniques - Multiplexing and de multiplexing of Amplitude Modulation (AM) / Frequency Modulation (FM) / Pulse Amplitude Modulation (PAM) / Pulse Position Modulation (PPM) / Pulse Width Modulation (PWM) signals.

Unit VII: Microcontroller (8051) (20 Questions)

Test, Service and troubleshoot the various components of microcontroller (8051) - Introduction of Microprocessor and 8051 Microcontroller – Function of different ICs used in the Microcontroller Kit – Differentiate microcontroller with microprocessor – interfacing of memory to the microcontroller – I/O port pin configuration – Register banks & their functioning. – SFRs & their configuration for different applications

Unit VIII: Sensors, Transducers Used in IOT Applications (20 Questions)

Execution the operation of different sensor, Identify and test various transducers of internet of Things IOT Applications - Different types of level sensors and their working – Thermocouple - Resistance Temperature Detectors (RTD) - Displacement Measurement using Linear Variable Differential Transformer (LVDT) - Proximity Sensors – IOT Applications :

Environmental, Smart Street Lighting and Smart Water & Waste Management - Role and Scope of IOT in Current and Future Market - Smart Objects, Wired - Cables, Hubs etc. Wireless - RFID, WiFi, Bluetooth etc - Different Functional Blocks of IOT Architecture.

Unit IX: Fiber Optic Communication, Digital Panel Meter, Solar System (20 Questions)

Preparation of fiber optic setup and execution transmission - Introduction to optical fiber, optical connection and various types optical amplifier, its advantages, properties of optic fiber, testing, losses, types of fiber optic cables and specifications – Encoding of light - Different types of seven segment displays, decoders and driver ICs - Principles of working of Liquid Crystal Display (LCD) – Use of Digital Panel Meter (DPM) with LCD to display different voltage & current signals – Working of Solar system - Solar Inverter.

Unit X: Cell Phones LCD and LED TV (20 Questions)

Identification, Operation of various controls troubleshoot and replace module of cell phone, Light Emitting Diode (LED) TV and LCD - Mobile Communication - Block Diagram and Features of Cell Phone – Cell phone Interfacing – Global System for Mobile (GSM) and Code-Division Multiple Access (CDMA) Technology – Difference between a conventional CTV with LCD & LED TVs – Principle of LCD and LED TV and function of its different section – Different types of interfaces like High Definition Multimedia Interface (HDMI), Universal Series Bus (USB), Red-Green-Blue (RGB) etc. TV Remote Control – Types, parts and functions.

20. Trade: Engineering Drawing and Draughtsman (Mechanical and Civil)

(ITI Standard)

Code: 551

Unit I: Drawing Instruments and their Uses, Sheet Layout, Types of Lines, Lettering and Dimensioning (20 Questions)

Drawing Instruments - Drawing board - 'T' Square - Mini Drafter – Set square - Scales - Protractor - French curves - Large & Bow compass - Divider – Pencils - Erasing shield etc.

Layout of Drawing Sheets - Size of Drawing Sheets - Designation of Drawing Sheets - Method of Folding - Title Block.

Types of Lines and their Applications - Continuous Thick - Continuous Thin (Straight) - Continuous Thin Free Hand - Continuous Thin (Straight) with Zig–Zag - Dashed Thick -Dashed Thin-Chain Thin -Chain Thin, Thick At Ends & Changes of Direction - Chain Thick-Chain Thin Double Dashed.

Lettering - Single Stroke - Double Stroke (Vertical, Inclined) - Styles of Lettering - Standard Heights / Width - Lower Case Letters and Numerals - Uppercase Lettering as per BIS SP: 46-2003-Spacing of Letters.

Dimensioning - Types of Arrowhead - System of Dimensioning (Unidirectional, Aligned) - Functional Dimension – Non-functional Dimension - Auxiliary or Reference Dimension - Method of Dimensioning and Common Features.

Unit II: Geometrical Figures, Special Curves, Free Hand Sketching and Scales (25 Questions)

Angles: Acute angle - Right angle - Obtuse angle - Straight angle - Reflex angle- Adjacent angles - Complementary angles -Supplementary angle

Triangles: Equilateral - Isosceles - Scalene – Right angled triangle - Acute angled triangle - Obtuse angled triangle.

Quadrilaterals: Square, Rectangle, Rhombus, Rhomboid (Parallelogram) Trapezium, Trapezoid.

Polygons - Pentagon, Hexagon, Heptagon, Octagon, Nonagon, Decagon

Definition - Ellipse – Parabola – Hyperbola - Different Methods of Their Construction.

Definition - Method of Drawing Involutes - Cycloidal Curves - Helix and Spiral.

Methods of Free Hand Sketching. (Lines, Circle, Arc, Ellipse, Isometric, Oblique, Orthographic)

Different Types of Scales - Their Appropriate Uses - Principle of R.F – Plain – Diagonal - Comparative and Vernier Scales - Scale of Chords

Conventions – Materials – Metals – Glass - Packing and Insulating Materials – Liquid – Wood - Concrete etc.

Unit III: Orthographic Projection, Projection of Solids, Sections, Conventions and Section of Solids (20 Questions)

Orthographic Projection - First Angle and Third Angle Projection - Principle of Orthographic Projection - Concept - Axes - Plane and Quadrant –Concept of First Angle and Third Angle Projection and its Difference.

Projection of Solids – Cube – Cuboid – Prism – Pyramids - Cylinder - Cone– Sphere and their Frustum.

Types of Sectional Views and their Uses - Cutting Plane and its Representation - Parts not shown in Section - Conventional Signs – Symbols - Abbreviations.

Section – Section Planes – True Shape of a Section

Unit IV: Hatching Techniques in Sectional View, Assembly View and Development of Surfaces (20 Questions)

Hatching Techniques: Hatching Angle - Hatching Assemblies - Hatching Large Areas - Hatching Areas in Different Parallel Planes - Dimensioning with in the Hatched Area - Thin Sections - Omission of Hatching Lines.

Sectional View: Full Section - Half Section - Offset Section – Auxiliary Section in Continuous Planes - Section in Two Intersecting Planes - Revolved Section - Removed Section - Local or Broken / Partial Section.

Definition - Development - Its Need in Industry - Different Methods of Developing the Surfaces - Development of Surfaces Bounded by Plane of Revolution Intersecting each other - Development of an Oblique Cone with Elliptical base - Calculation of Developed Lengths of Geometrical Solids.

Unit V: Isometric Projection and Oblique Projection (10 Questions)

Principle of Isometric Projection and Isometric drawing - Methods of Isometric Projection – Dimensioning - Isometric Scale - Difference between Isometric Drawing and Isometric Projection.

Principles of Making Orthographic views from Isometric drawing - Selection of views for Construction of Orthographic drawings for clear Description of the Object.

Principle and Types of Oblique Projection - Advantage of Oblique Projection over Isometric Projection

Unit VI: Screw Threads, Bolts, Nuts, Washers, Screws, Locking Devices and Foundation Bolts (30 Questions)

Screw Thread: Nomenclature – Proportion and their Uses - External Thread - Internal Thread - Convention of Internal and External Threads - Right Hand and Left Hand Thread – Single/ Multiple Start Threads – 'V' Threads – British Standard Whitworth Thread (BSW) - British Standard Fine (BSF) Threads -British Association - Metric - Unified – Sellers - Square - Acme - Buttress Threads

Types of Bolts: Hexagonal -Square head - Cylindrical or Cheese head - Cup head or round head - Hook - Eye - Lifting eye - Counter sunk head - Cap screw or tap bolt.

Types of Nuts: Hexagonal - Square - Collared - Cap -Dome - Capstan or Cylindrical - Ring nut.

Types of Washer: Plain – Chamfered - Spring Washer.

Types of Screws: Flat - Cone - Half dog - Full dog - Cup - Conical Point.

Locking Devices: Spilt Pin - Slotted Nut - Castle Nut - Sawn Nut or Wipes Nut - Simmond Lock Nut – Penn Ring or Grooved Nut.

Foundation Bolt: Eye - Rag - Lewis - Cotter Foundation Bolt.

Unit VII: Rivets, Riveted Joints, Welded Joints, Weld Symbols, Pipe Joints and Carpentry Joints (25 Questions)

Rivets: Snap - Ellipsoid - Pan - Conical - Counter Sunk (Flat / Rounded) - Steeple Head.

Riveted Joints: Lap Joint – Single Riveted -Double Riveted (Chain) - Double Riveted (Zig - Zag) Lap Joint - Butt Joint - Single Riveted (Single Strap) - Single Riveted (Double Strap) Butt Joint - Double Riveted (Single Strap/Double Strap) (Chain/ (Zig - Zag)) Butt Joint

Welded Joint & Symbols: Butt Joint: Square Butt - Bevel Groove – V/J/U (Single/Double) - Flare V Groove Weld. Corner Joint: Fillet - Spot -Square Groove Or Butt – V / U /J Groove - Bevel Groove – Flare V Groove – Edge - Corner Flange Weld – **T Joint:** Fillet - Plug - Slot - Bevel Groove - J Groove – Flare Bevel Groove - Melt Through Weld. **Lap Joint:** Fillet Weld - Bevel - J Groove - Plug - Slot - Spot - Flare Bevel Groove Weld. **Edge Joint:** Square Groove or Butt - Bevel Groove - V / J / U Groove Weld - Edge Flange Weld - Corner Flange Weld.

Pipe Joints: Screwed pipe - Welded pipe - Flanged pipe(Integral / Screwed)- Glued pipe or Cemented - Soldered pipe joint - Pipe Fittings - Coupler- Reducer coupler- 90° elbow - 90° Reducer elbow - 90° bend - Return bend - Tee - Reducer Tee - Cross - Close Nipple - Short Nipple - Short Nipple with Hexagonal grip - Hose nipple - Male plug - Female plug - Screwed Union – Flange - Piping Layout - Single line isometric layout - Double line isometric layout - Single line Orthographic layout - Double line Orthographic layout.

Carpentry Joints: Mortise and Tennon – Butt – Dove Tail –Tongue and Groove – Dowel – Mitre - Half Lap - Spline – Lap – Bridle Joint.

Unit VIII: Electrical, Electronics and Network Components, Layout, Circuit and Block Diagram (20 Questions)

Electrical Components: Fire alarm - Geyser - Thermostats - Electric Iron - Automatic electric Iron - Electric bell - Electric buzzer - Electric heater - Heater plate - Electric stove - Hotplate - Micro oven.

Electrical wiring diagram and Layout diagram: Layout arrangement of DC Generator control panel - Compound motor layout arrangement - 3 phase squirrel cage motor - Automatic voltage regulation - Connections of 3 phase alternator with load - Connection diagram of auto transformer starter - Wiring diagram of a direct online starter with protective devices – Pipe / Plate earthing.

Electrical circuit diagram: Three phase switching circuit diagram - Three phasing squirrel cage motor - circuit diagram - Circuit diagram controlling by MCB - Schematic diagram of two point and three point starters.

Block diagram of Instruments and Equipment: Block diagram of invertor - ON line UPS - OFF line UPS - Block diagram of DSO - Block diagram of Function generator.

Electronics Components: Carbon composition - Metal Film - Metal Oxide - Radial Leads - Precision Resistor - Metal film Resistor - Network Resistor - Low ohm metal Flim Resistor - Integrated Resistor - Capacitor.

Electronics Wiring diagram and layout diagram: SPV system and solar charge controller – Stand alone system - Hybrid system - Grid connected system - Single Phase UPS system - SMPS in DVD player - SMPS in home theatre main board - SMPS in cell phone charger - SMPS in LED TV - SMPS in LCD monitor.

Electronics circuit diagram: Different schematic of LED drivers - Composite video signal - TV signal spectrum - Buck converter - Function of SMPS in PC - Un interruptible power supply (UPS) - IC based AM Transmitter.

Electronics Block diagram: Fly back converter type SMPS - Forward converter type SMPS - Online UPS using pic micro controller - Online UPS - OFF line UPS - CDMA system - Features of cell phone system - Television broadcasting system - B/W TV receiver system - LED back light and driver system - LED TV system - DSO system - Generator using IC 8038 system - FM Receiver system - micro controller IC 8051 system.

Network Components and Internet topologies: Network Components – Modems – Firewall – Hubs – Bridges – Routers – Gateways – Repeaters – Transceivers – Switches - Access point – Types.

Network Topologies – Star – Ring – Bus – Tree – Mesh - Hybrid - Type of Networks – Local Area Networks (LAN) - Metropolitan Area Networks (MAN) - Personal Area Network (PAN) - Controller Area Network (CAN) - Wide Area Networks (WAN) – Internet – Ethernet - Wi-Fi – Bluetooth - Mobile Networking - Wire and wireless Networking.

Unit IX: Mechanical, Automobile, RAC Components, Layout, Circuit and Block Diagram (20 Questions)

Mechanical symbols : Bulb indicator - Cruise control indicator - Traction control indicator - Stability control indicator - Center differential lock - Proximity sensor indicator - Econ indicator - Electric power steering indicator - Glow plug indicator - Check engine light – Seat belt indicator - Airbag indicator - ABS indicator - Temperature warning - Oil level / pressure warning - Electrical system warning - Transmission warning light - Tire pressure monitoring system - High beam indicator - Manual general - Push button - Foot pedal - Spring return - Spring centered - Plunger - Roller operated - Hydraulic direct actuation - Hydraulic pilot actuation - Pneumatic direct actuation - Electrical - Battery - Generator - Resistance - Coil with core - Contact breaker - Fuse - Bulb - Earth - Heavy duty switches - Rheostat - Induction coil - Condenser - Wire crossed - Ammeter - Motor - Switch - Coil - Spark gap - Rectifier - Wire joint - Voltmeter.

Components used in Automobile: Flat type rim - Drop center rim - Wheel construction - Wire spoke wheels - Tube Tyre - Tubeless tyre - Disc wheel - Wire wheel - Split wheel - Drum brake - Disc brake - Spiral bevel gears - Herring bone gears - Spur gears - Helical gears - Rack and pinion - Worm gears – Multi plate clutch - Ignition coil - Distributor - Steering gear box - Traction battery pack - DC converter - Electric motor - Charge port - Controller - Auxiliary batteries - Engines use spark plug with tapered seats.

Wiring diagram and layout diagram used in Automobile: Wind shield wiper motor wiring diagram - Twin horn circuit - Construction Electric horn - Mechanical brakes - Vacuum assisted power brakes - Vacuum suspended power brakes - Wiring diagram of Electronic flasher - Electric car wiring diagram - Lighting system - Horn circuit connection.

Circuit diagram used in Automobile:

Twin - horn circuit - Distributor less ignition system - Flasher circuit - Automotive electric system - Description of starting circuit - Alternator charging circuit - Construction of solenoid switch - The circuit for electric operation of a rear passenger window - Central door locking circuit.

Block diagram used in Automobile:

Electronic power steering system - Dual air bag arrangement with one HCV front and two HCV rear - TCS block diagram - Block diagram of an electric car - Block diagram of an electric vehicle with V2G - Block diagram of a typical plug in electric vehicle PEV system - EV power train block diagram - 3 speed automatic gearbox with electro hydraulic control - shift pressure controls - Block diagram of electronic automatic gear box control - Engine immobilizer system diagram.

Wiring diagram and layout diagram used in RAC:

Wiring diagram of water cooler - Wiring diagram of Upright freezer - Single Phase wiring circuit - 3 phase wiring circuit - Wiring diagram of Walk in cooler - Hot gas defrosting - Ozonisation of cooling tower water - wiring circuit of cold storage plant - Circuit diagram of a cold storage with air cooled condenser and 3 compressor motor and all interlocking controls - Typical wiring diagram of Air cooled self contained unit - Motor control with protective device - Condenser water pump - Control power to the cooling tower fan starter - Electric over load (over current protector) Car AC wiring circuit - Location of heat exchanger - Fake ice maker machine - System pressure test by dry nitrogen - System with charging connection near king valve.

Circuit diagram used in RAC:

Two speed motor control capacity control - Schematic electrical power circuit for a ice plant (3 phase) - Schematic electrical control circuit for a ice plant (Single phase) - Three wire control of a magnetic contactor type on line starter - Basic refrigeration cycle in a VRV/VRF system - Refrigeration cycle cooling of VRV/VEF - Heating cycle of heat pump VRF/VRV - Heat recovery VRF - Refrigeration system with liquid cooler and water cooled condenser - Wiring diagram of circuit for upright freezer.

Block diagram used in RAC: Problem tree of brine leak in ice plant - Block diagram of VRV/VRF - Block diagram of Digital Oscilloscope - Functional block diagram of Ionization Vaccum Gauge - Block diagram of Digital speed Tachometer.

UNIT X: Computer Aided Drafting (10 Questions)

Computer basics - Windows operating system - file management system - Computer hardware and software specification - installation of application software.

CAD - Advantages of using CAD - CAD main Menu - screen menu - command line - model space, - layout space - Drawing layouts - Tool bars - File creation – Save - Open existing drawings - creation of Drawing Sheet as per ISO.

Absolute Co-ordinate system - Polar Co-ordinate System - Relative Co-ordinate System – Draw tools - Create Line.

Draw commands - Line – polyline – ray – polygon – circle – rectangle – arc – ellipse - using different options.

Modify commands – Trim – Offset – Fillet – Chamfer – Break – Erase - using different options

Move – Copy – Array - Insert Block - Make Block – Scale – Rotate – Hatch - Commands.

Creating templates - Inserting drawings – Layers - Modify Layers.

Format dimension style - Creating new dimension style - Modifying styles in dimensioning - Writing text on dimension line and on leader - Edit text dimension.

Shortcut keyboard commands - Customization of keyboard command - Customization of drafting settings - Changing orthographic snap to isometric snap.

Procedure to create viewport in layout space in zooming scale.

3D modelling - 3D primitives (viz. box, sphere, cylinder, mesh and poly-solids), solid figure – extrude - revolve - sweep and loft command - solid editing – fillet – offset – taper - shell and slice command. Setting of User co-ordinate Systems – Rotating - Print preview and Plotting.

21. Trade: Fashion Design and Technology

(ITI Standard)

Code: 570

Unit I: Fashion Elements and Principles of Design (15 questions)

Fashion definition - Introduction to elements of design - line, shape, textures, colour and forms - Fundamentals and basics of colour - Colour wheel, colour theories and colour scheme - Tint and shade - Principles of Design - Brief study of fashion drawing tools, materials and techniques.

Unit II: Human Anatomy, Measurements and Pattern (15 questions)

Human Anatomy - Joints and muscles - Growth and development - Eight head theory - Types of human figure - Introduction to measurement - ISI Standards of measurements - Relationship of sizes & measurements - Methods of measuring body and dress form - Measurement charts - Introduction to paper pattern – Types - Flat Pattern and Draped pattern - Important consideration while making paper pattern - Introduction to - Bodice Block - sleeve block - skirt block.

Unit III: Pattern Drafting and Construction (15 questions)

Introduction to Fasteners, Trimmings, Hems and Necklines - Edge finishing Hems - Introduction to Kids Pattern (Drafting, pattern making, estimation and layout of the garments) - Child Bodice block and sleeve block with size variation - Skirt Block for children – straight and circular - Drafting and construction of Frock, skirt, night suit - Brief study of sewing threads and needles – sewing defects and remedies.

Unit IV: Introduction to Sewing Machines and Attachments (20 questions)

Tools & Equipment - Measuring tools - Marking tools - Cutting tools - Pressing tools - Introduction to sewing machine & its components - Basic parts, attachments and their applications - Classification of sewing machine, cutting machines, finishing equipment and their applications - Importance of safety and general precautions in garment industries - Introduction to work ethics, Discipline – Ergonomics – Personal protective equipments for Garment industry.

Unit V: Introduction to Yarn, Fabric and Processing (30 questions)

Textile fabric, Meaning and definition of textile fibres - Classification of fibres - Natural Fibres - Manmade Fibres - Characteristics/ properties of above mentioned fibres - Identification of textile fibres and yarn construction - Elementary processing of different types of fibre to yarn - Characteristic of yarn - twist - Size – count and count measuring system - Types of yarn - Simple – Complex - Yarn preparation - Fabric manufacturing - Elementary weaving theory – Fabri structure - Woven, Knitted and non-woven – Introduction to Dyeing – Printing - Introduction to knitting - Types of Knitted Fabric used in garment industry

- Finishes - Mechanical and Chemical - Introduction and identification of Different type of Cotton fabric, Synthetic, Woolen, Sheer, Silk, Linen, Pile fabrics.

Unit VI: Design Development and Surface Ornamentation (25 questions)

Motifs (enlargement and reduction) - Sources of design inspiration & conceptualization optical illusion, silhouette - Introduction to Hand Stitching - Introduction to decorative stitches - Flat Stitches - Looped stitches - Knotted stitches - Crossed stitches - Introduction to Seams and Seam Finishes - Introducing Fullness - Darts, Pleats, Tucks, Gathers, Shirrs, Frills and Godets Introduction to Plackets and Openings - Pockets, Facing and Binding.

Unit VII: Fashion Drawing and Rendering Techniques (10 questions)

Fashion Drawings - Block Figure, Stick Figure, Fleshing out - Rendering of different type of fabric - Plain, Checks, Dotted, Printed, Stripped and Textured - Working with special effects - Creating Fabric Designs - Accessories Designing - Introduction and importance of designing through computers - Use of Corel Draw in Design creation - tools - working with Shapes

Unit VIII: Fashion Draping and Wardrobe Planning (20questions)

Draping - Principles of draping - Methods of Draping - Draping Techniques - Ladies wear, long dresses, Basic bodice, Basic skirts - Draping of indo - western ladies wear - Wardrobe planning - Selection of Dresses according to age, occasion, climate, personality and sex - Age group relation to design - various categories of men's wear, women's wear, kids wear - Introduction to trims and accessories for fashion industry - Fashion accessories – Head Gears – Scarf - Fashion Jewellery - Tie and Bow - Belts – Bag - Purses and Hand Gloves.

Unit IX: Apparel Quality Control and Fabric Identification (30 questions)

Introduction to Quality control and Quality assurance - Quality Management - Textile Testing and product – Evaluation - Quality Inspection. Care Labelling of apparels - Checking of garment with respect to measurement and stitching - Stain removal - Immediate repairing - Identification of Different type of fabric - Cotton - Synthetic - Woolen – Sheer - Silk – Linen - Pile fabrics - Plain weave - Twill weave - Basket weave - Sateen weave - Rib weave Honey comb. Knitting samples – warp knit & weft knit.

Unit X: Fashion Industry and Career Prospect (20 questions)

Career in fashion - Fashion designer - Auxiliary Service in Fashion Design - Fashion Design Technician – Education – Industry - Meaning and scope of business - Introduction to Fashion merchandising - Brief knowledge of fashion trend, trade fairs, fashion show, boutique, garment production unit - Study of fashion Fraternity - Leading Fashion Designers - Textile Designers.

22. Trade - Fitter

(ITI Standard)

Code: 436

Unit I: Safety and Its Important (10 Questions)

Safety and General Precautions in Industry/Shop floor - Personal Productive Equipments (PPE) - First Aid**–** Operations of Electrical Mains - Disposal of Waste Materials- Occupational Safety and Health– Safety Signs – Response to Emergencies – Importance of House Keeping – Material Handling - Lifting and Handling Loads – Moving Heavy Equipments.

Unit II: Basic Fitting (30 Questions)

Linear Measurement – Base unit of linear measurement, System of units of measurement, Multiples of a Metre and their values. Steel Rule - Purpose of steel rule, Types, precautions to be followed while using steel rule.
Marking Instruments – Feature, uses and type of Scriber, Caliper, Punches, Hammer, "V" Block, Try Square - Bevel Gauge, Bevel Protractor, Combination Set, Surface Gauge, Surface Plate, Angle Plate.

Cutting Tools – Hack Saw Frames, Hacksaw Blades, Files and Special files types and specification, Cold chisel and types, Power Saws, Drilling Machines, Drilling Operations, Drills, Taps, Dies, Tap drill size and Blank Size calculation.

Grinding – Grinding Machines, Grinding Wheel Specification, Loading, Glazzing, Dressing and Truing.

Work holding Devices – Bench Vice, Machine Vice, Clamps and Strap.

Tool Holding Devices – Drill Chuck & Key, Tapper Sleeve & Sockets, Tap Wrench, Die Stock.

Precision Measuring Instruments – construction, Least Count, Graduation and types of Vernier Caliper, Micro Metre, Vernier Micrometer, Screw thread Micrometer, Vernier Bevel Protractor, Dial Caliper, Dial test indicator and camparator.

Unit III: Sheet Metal Work (20 Questions)

Safety in sheet metal work shop - Metal sheets and their uses – Hand lever shear – Sheet metal Tools, Different shear operation - Rivet & Riveting - Solder & Soldering.

Unit IV: Welding (20 Questions)

Safety in welding shop - Welding Hand Tools – Gas Welding Equipments and Process – Setting of Parameter for Arc welding Machines – Oxy – Acetylene cutting Equipments – Arc welding defects and Testing – Types of Joints – Selection and Storage of Electrodes.

Unit V: Limit, Fit, Tolerance and Interchangeabilty (10 Questions)

Necessity of Interchangeability – Standard System of Limit and Fits Terminology – Fits and Classification as per Indian Standard – BIS system of Limits and Fits reading the standard chart – Hole and Shaft basis system of Limit and Fit.

Unit VI: Turning (20 Questions)

Safety while working on Lathes – Lathe Main Parts – Feed & Thread cutting Mechanism – Methods of Holding Jobs – Different Lathe Operations – Lathe Tool and its Nomenclature – Tool Selection – Lathe cutting speed and Feed – Use of Cutting fluid (Coolant) and Properties.

Unit VII: Basic Maintenance, Erection and Testing of Machineries (20 Questions)

Total Productive Maintenance – Routine Maintenance – Break down Maintenance & Preventive Maintenance - Installation of Machinery – Foundation bolts and types – Sling Load for Shifting – Erection Tools and Techniques – Fork Lift and Pallet Truck - Lubricant and its Properties – Types of Lubrication - Different Methods of Lubrication.

Repair Technique – Power Transmission Elements and its types, application and Uses (Gear, Belt and Pulley, Coupling, Chain and Sproket, Clutches, Bearing and bearing metals – Velocity Ratio calculation in Gear and Belt and chain drive.

Unit VIII: Metals: Metal & Non Metal (20 Questions)

Ferrous Metal Manufacturing process and properties (Pig Iron , Cast Iron , Wrought Iron and Steel) – Non - Ferrous Metal properties and uses (Aluminium , Lead , Tin Copper , Zinc and their Alloys) – Heat

Treatment – Structure of steels – Annealing – Normalizing - Hardening – Tempering – Different methods of Surface hardening - Prevention of Rust and Corrosion - Galvanizing , Electro Plating , Cladding , Metal Spraying and Cementation.

Unit IX: Assembling (30 Questions)

Locking Devices – Screws, Bolt and Nuts, Keys, Cotters, Split Pin, Screw Driver, Spanners, Power Tools.

Gauges and Template – Radius gauge , Screw Pitch gauge , Drill Gauge , Centre gauge , Feeler gauge , Wire gauge , Telescopic gauge.

Limit Gauges – Principle of 'Go' and 'No-GO' - Plug gauge, Snap gauge, Ring gauge, Taper gauge.

Sine bar and Slip gauge – Principle, uses, application and Taper calculation.

Finishing Process – Lapping, Honing, Frosting and Scrapping – Application and Methods.

Jig and Fixtures – Construction, Types and its accessories – Advantages and Disadvantages.

Inspection – Visual inspection, Quality Standard, Quality control inspection.

Unit X: Hydraulics and Pneumatics (20 Questions)

Hydraulics – Safety precautions – Symbols – Filters – Pumps – Cylinders – Flow control Valves – Tube and pipe assembly – application and common maintenance of hydraulic.

Pneumatics – Safety Precautions – Symbols – FRL Unit – Actuator – Cylinder – Types of pneumatic valve – Air compressor parts and function – Electro pneumatic system - application and common maintenance of pneumatic.

Pipe and Pipe fittings – Pipe fitting Tools, Symbols, Standard pipe fitting accessorie, Pipe thread, Pipe die and Tap, Repair and maintenance of Water Tap.

23. Trade - Food Production (General)

(ITI Standard)

Code: 536

Unit I: General Safety Precaution and First Aid of Kitchen (10 Questions)

Elementry of first aid – Importance of safety work in kitchen – Personal safety and grooming - General safety in Hotel industries – How to handle electronic equipments and machineries.

Unit II: Maintain Cleanliness of Kitchen, Handling Equipment and Utensils Safely, Hierarchy of Kitchen (10 Questions)

Understand the work flow of kitchen – Follow the rules and regulations of kitchen – Identification of kitchen service equipments - How to handle the kitchen epuipment – Hygiene or Cleanliness and procedure to maintain in kitchen – Disposal procedure of waste material in kitchen – Duties and responsibilities of kitchen Hierarchy.

Unit III: Menu Planning and Menu Engineering (20 Questions)

Classification of raw materials – Preparation of Ingredients – Method of mixing food – Effect of heat on various food – Reaction with metal in acid / alkaline medium – weighing and measures texture of food – International Standard of meats and Cheese – Indian culinary terms - French culinary terms – Asian Cuisine, American Cuisine and Continental cuisine – A' la carte, Buffet, Table d' hote , Gueridon service and Banquet service.

Unit IV: Method of Cooking (30 Questions)

Mise en place – Cutting techniques – Yield management and wastage control – Methods of cooking special application Sauteing, Searing, Braising, Boiling, Poaching, Broiling, Grilling, Baking, Steaming, Stewing, blanching, Roasting and Frying – Method of cooking special application of meat, fish, vegetable, cheese, pulses and eggs – Conventional method of cooking, Microwave cooking, Non-Conventional method solar and fast food cooking operation.

Unit V: Cold Food Preparation Salads, Soups, Vegetable (English Vegetables) and Butter (30 Questions)

Salad dressing and their classification – Accompaniments and garnish – Basic stock aspic & Jellies – Roux blanc, Roux blonde, Roux burn –Types of Soups (International Soup) - Types of stocks and sauce – derivative of sauces – Method of cooking different vegetables – Types of English vegetables – Types of butter and history – Types of cheeses (International Cheese)

Unit VI: Herbs and Contiments, Spices, Pulses and Cereals, Appetizer and Starters, Fruits, Juices and Eggs (10 Questions)

Types of Herbs and contiments – Types of Spices – Types of Pulses - Types of Cereals - Types of Sandwiches and Canapes - Types of Fruits - Types of Juices – Types of cooking eggs – Uses of eggs in kitchen

Unit VII: Cuts of Meats, Game Birds, Poultry and Sea Foods with their Sauces (15 Questions)

Cuts of Beef, Lamb, Mutton, Pork and Weighing – Poultry classification preparation dressings cuts and uses – Classification of Game birds preparation cuts and uses – Fish classification scaling, cleaning and preparation cuts and uses.

Unit VIII: Bakery and Confectionary Foods, Sweet Dishes and Cold Desserts (30 Questions)

Characteristics and types of leavening / Raising agent – Types of yeast – Types of flour – Types of pastries – Principle of pastry making – Working techniques – Types of breads and bread rolls – Types of cakes, gateau, pastries – Pie and cookies varieties – Custards, Creams, Frozen desserts and Sauces - Varieties of Indian Sweet dishes.

Unit IX: Indian Cuisine, Chinese Cuisine, French Cuisine, Italian Cuisine (25 Questions)

Indian types of breakfast menu, Lunch menu, Dinner Menu, Variety of Dhal – Main Course dishes – Chinese menu, types of soup, types of noodles, types of rice, types of dessert – French breakfast menu, Gueridon service, French service – Types of pasta, Types of pizza.

Unit X: Food Safety Standard Authority of India (FSSAI) and Hazard Analyse Critical Control Point (HACCP) (20 Questions)

Prevailing food standards in India – Food adultration as a public health hazard – Sample test in the detection of common food – Types of Hazard - Biological Hazard, Chemical Hazard and Physical Hazard.

24. Trade: In-Plant Logistics Assistant

(ITI Standard)

Code: 569

Unit I: Safe working Practice (15 Questions)

Types of dangerous goods and their associated risks - Ways of safe handling - Safety rules and Procedures - Standard operating procedures (SOP) and the handling procedure in case of miss-happenings - Company safety policy, inside the company premises - Personal Protective Equipment

(PPE) and their usage - consequences of wrong usage - Selection of PPE - Details Occupational Safety and Health Administration standards (OSHA) and its application - 5S and its implementation and practice in the company - Health, Safety and Security measures to be adopted during operations and its maintenance.

Unit II: Body postures - benefits and hazards (10 Questions)

Physical requirements for performing different functions (Body Positions) - Different body postures for different activities - their benefits and hazards.

Unit III: Concepts of Logistics in a manufacturing setup and Supply Chain Logistics (20 Questions)

Introduction to Logistics in a manufacturing setup - key concepts of Logistics in a manufacturing setup and supply chain logistics - Key activities being conducted – Inbound, in-plant and outbound activities - Types of roles and associated responsibility of in-plant logistics technician - logistics activities in an industrial setup - information of different logistics activities.

Unit IV: In-plant logistics activities (20 Questions)

Basic activities of in-plant logistics, Loading, Unloading, Receiving, Sorting, Storing, Picking and Dispatch activities - The process of coordinating with assembly line regarding requirement and addressing the same in a timely manner - learning group activities connected with in plant logistics.

Unit V: Basic inventory management (25 Questions)

Elaborate receiving and storage processes - Basics of allocation of Goods storage location – Introduction to different types of inventory management – FIFO (First In First Out), LIFO (Last In First Out) - Basic advantages, benefits, challenges associated with inventory models and suitability to different manufacturing setups - Keeping the inventory count and records under various methods - Changing inventory levels - Cross verification of Inventory - Do's and Don'ts during Inventory counting - Various good practices associated with inventory management and handling - benefits – Good practices associated with inventory management and handling.

Unit VI: Use of Tracking Devices in Warehouse (20 Questions)

Knowledge on Computer and Associated software - Communication Devices used in warehouse environment to track and count inventory - Knowledge on Scanning equipment including Bar / QR Code Scanner and Radio Frequency Identification (RFID) devices used

Unit VII: Material Handling Equipment (MHE) (10 Questions)

Various MHEs like forklift, Conveyors, Industrial cranes, Industrial Trucks, Industrial Robots, Automated Guided Vehicles (AGV) - Their Capacity, Usage, Technical Limitations - Suitability of use for different activities.

Unit VIII: Inbound process (30 Questions)

Different types of raw materials and intermediary goods that can be procured and stored - Various Work in Progress (WIP) and finished goods that can be stored – Equipment for different scenarios and Products – Different Types of Forms and Reports Available - Requirement of the manufacturing line and maintaining the required inventory of different items - Co-coordinating with vendors of timely supply of appropriate quantities of items based on usage norms and requirement of manufacturing setup - Various Verifications to be undertaken at the time of receipt of goods - Basic formats and reporting associated with receipt of goods - Updating of counts in routine Planning and scheduling deliveries as per requirement - Various best practices associated with handling in-plant logistics for inbound process.

Unit IX: Out-bound process (30 Questions)

Different dispatch orders and associated signing authorities for acknowledgment and delivery reports - Instructions coming from manufacturing setup – Selection of right equipment for different scenarios and products - Process of identifying the item and the required carrier for industrial setup - Efficient outbound process management - The processes – Instructions coming from manufacturing setup - Delivery Scheduling - Carrier resource utilization and identification of items for carrier to carry/transport - Delivery Scheduling - Carrier Resource Management - Activities to be conducted in dispatch - Dispatch Record – Number verification and type of product - Dispatch Acknowledgement – Dispatch Record - Number and Type Of Product - co-ordination with manufacturing and delivery teams - delivery and delivery reports - Various good practices associated with product handling and their benefits.

Unit X: Documentation and Reporting (20 Questions)

Different types of reports related to inventory change, dispatches, delivery success, inbound receipts - Different types of Management Information System (MIS) systems that are commonly used for reporting Making and updating reports in MIS - Microsoft excel or open office - Various good practices associated with reporting activities and their benefits.

25. Trade - Industrial Robotics and Digital Manufacturing Technician

(ITI Standard)

Code: 538

Unit I: General Safety Precautions and First Aid (15 Questions)

Safety and General Precautions – First Aid – PPEs – 5s – Occupational Safety and health – Fire Extinquishers-Safety Signs – Response to Emergencies safe use of tools and equipments.

Unit II: Customer Needs and Product Specifications (10 Questions)

Customer needs and Specifications – Product Design Development – Customer Relationship Management-Prepare check list of customers needs-Products Specifications.

Unit III: Knowledge of Industrial Engineering Drawing and Requirements (15 Questions)

GD & Symbol on Engineering Drawing – Concept of Limits Fits tolerances & Symbols – Reading of Industrial Drawing – Customer Specific Requirements-Checklist of Dimensions-Importance of Interchangeability and ISO standards.

Unit IV: Various Types of Industrial Robots and Perform Their Configuration, Robotic Cell Components and Application of Tools, Installation of Robot, Power on the Robot and Making the Cell (25 Questions)

Application of Industrial Robot – Various types of Robots – Different Configurations of Robots – Robotic cell Components – Types of Sensors used in Industrial Robot – Install and Inspect Mechanical and Electrical Connections – Robot Structure and Functions of Robot System and Additional Equipments – Starting up and Shutdown steps Robot – Concept of Robotic cell Health-Importance of Robots in Manufacturing and – Production Industrial Case Studies of Customization and Trending Application Robot in Industry-Safety Measures of industrial Robots – Physical Grouting of Robot and other Peripheral Devices.

Unit V: Run Operations with Teach Pendent Key Functions and User Interface for Teach Pendant. (30 Questions)

Function of the Front and Back of the Teach Pendant-Tool Coordinate System – User Interface of the Teach Pendant – Different touch Pendant Function Keys – Types of Mode - Types of Motion.

Unit VI: Industrial Robot Simulation / Software, Industrial Need to Create a Program with Help of Robotic Simulation Software. (25 Questions)

Robot components and creating new model in Simulation Position, Variation in Robots – Robot axis Movement – Cycle time and its importance – Importance of tool path optimization Techniques-Calculate the Productivity and Machining cost of Operation-Create Welding and Pick and place program with help of Simulation Software and Compare the Tool Path with manual Program-Various types Communication interface available in Robot Simulation Software-Basic Components of Robots and its Functions-Operator Job In Robot Cell – Safety Consideration-Create the Welding Program and Pick and Place Program in Simulation Software.

Unit VII: Robotic Coordinate System (15 Questions)

Co-Ordinate system by multiple motion movements, Types of Coordinate System - X, Y, Z Coordinate System-Axis System of Robots-Type of Joints in Robot.

Unit VIII: Application of Tools and Components, Architecture of Welding Robot System - Establish Communication with PLC and Assemble Welding Torch for Operation (25 Questions)

Application based modification in Robotic cell Components – Assembling of Gripper to Manipulator, Resolve the Incorporate programming, Pendant & alarm resolution, Parameters setting of application based controllers – PLC and Robot Communication for Communicate with HMI – Loop control instructions – Power source connection with Robot controller - Selection Welding Tool Robot- End effector and their Functions.

Unit IX: Read existing Program and Execution Techniques operation of Industrial Robots, Following the safety procedure for Programmer. (25 Questions)

Different connections of Grippers – Pick and Place Program with help of Gripper – Hand Instruction in Robot-Different Motion Parameters – Program and Execution Techniques – Operation of Industrial Robots-Safety Procedure for Programmer – Welding Parameters Settings, Concept of Industry 4.0 - Remote Monitoring and Connectivity of Industrial Robot.

Unit X: Preventive Maintenance and Basic Trouble Shooting. (15 Questions)

Preventive Maintenance plan – Standard Operating Procedure-Inspect Weld wire and replacing of Weld wire-Verifying the Welding Gas-Use of Tool Kit used for Robotics Preventive Maintenance & basic Trouble Shoot-Verify all the safety Sensors.

26. Trade - Information and Communication Technology System Maintenance

(ITI Standard)

Code: 537

Unit I: Basic Electrical and Passive Components (25 Questions)

Safety Precaution – First Aid – Basic Electrical Components – Classification of Measuring Instruments – Measurement of Current, Voltage, Resistance and Power – Soldering and Desoldering – Types and Classifications of Resistors, Inductors, Capacitors, Transformers – Working principles and Applications - Verification of Ohm's Law and Kirchhoff's Laws – Resonance

Unit II: Active Components (30 Questions)

Types of Semi-Conductors, Diodes and Characteristics working principles and application – Types of Rectifiers and Filters working principles and application– Zener Diodes Characteristics and Voltage Regulation working principles and application – Types and Classification of Transistors – Characteristics and Configurations – Working principles and application - Types of Biasing and amplifiers - Working

principles and application – Types of Field Effect Transistor (FET) – Uni-Junction Transistor (UJT), Silicon Controlled Rectifier (SCR), Triode for Alternating Current (TRIAC), Diode for Alternating Current (DIAC) working principles and application.

Unit III: Power Supply, Logic Circuits and CRO (35 Questions)

Power Supply – Fixed and Variable – Inverters and converters working principles and application – Uninterruptible Power Supply (UPS) – Types working principles and applications – Cells and Battery Types and its Classification – Construction and Applications - Number system and conversion. Basic Logic Gates – Truth table and Boolean Algebra – Combinational Logic Circuits – Comparator – Decoder and Encoder – Multiplexer and Demultiplexer – Flip Flops – Types and Applications – Counters and its Types – Converters and its Types and Applications – Shift Registers and its Types and Applications – K-Maps – Cathode Ray Oscilloscope (CRO) working principles, Parameters and Applications - Stepper Motor - Drive – Types of Sensors and Relays - Microprocessor – Basic Architecture.

Unit IV: Computer Software and Hardware (20 Questions)

Introduction to word processing and spread sheet software – formatting text and Editing – Mail Merge and printing – formatting cells – formula in cells – features and applications - Introduction to computers – classification Generation and Application - Basic Hand Tools used for computer and specification - Types of cabinet, form factor – cables and connectors - Types and functions of Input / output (I/O) Devices, Ports, Keyboard Mouse, Monitor Speaker, Mike – Types, Classification and specification of Processors and Semiconductor Memories - Memory devices: Floppy Disk Drive , Hard Disk Drive, CD ROM Drive, DVD ROM Drive, Technology and working principles HDD parts and its working principles, performance, features, precautions, preventive maintenance – Complementary Metal – Oxide Semiconductor (CMOS) setting – scan and Defrag – Installation of System software and Application software – Functions of GUI, Description of Desktop icons, control Panel, Properties and Execution.

Unit V: System Utilities, Windows Utilities and Laptop Computer (25 Questions)

Magnetic, optical and magneto optical drives – Types, working principles and application – Formatting and partitioning of Hard disk drive – Redundant Array of Independent Disk (RAID) – Bad sector in HDD – Master Boot Record (MBR) Types of malware – Antivirus and Anti – Spy ware software, Virus removal –Software version and Updation - Different configurations of computer and its peripherals compatibilities - Pre-Installation and Post-Installation software - Backup procedures – Awareness of Legal Aspects of using computers - Installing Hardware drivers – Device Manager – Power on self-Text (POST)-Junk file Removal – Linux OS – outlook configure and Backup – Laptop and its types and working principles – Switched Mode Power Supply (SMPS) – Mother Board types, Components on Mother Board and their Interconnection – Chipset and Bus standards – Processors – Types, versions – BIOS - Description of Communication ports in mother Board – Upgrading components on Mother Board – Jumper setting and CMOS features – Single In-line Memory Module (SIMM) & Dual In-line Memory Model (DIMM) Memory Modules.

Unit VI: Linux Operating System and Computer Peripherals (10 Questions)

Basic Linux Commands – Types of Printers and its Classifications – Dot-matrix, Laser, Inkjet, Passbook - Block diagram and function of each unit installation Techniques - working principles of mechanical assembly and sensors. Replacing and refilling of toner cartridges - Working principles of Plotters, MFD, Network Printers and Scanners – Precaution – Preventive maintenance – Probable Defects – Circuit analysis – Servicing.

Unit VII: Monitors, Projectors and Uninterrupted Power Supply (UPS) (15 Questions)

Types of Monitors, Classifications, Specification and working principles – Comparison between Cathode Ray Tube (CRT), Thin Film Transistor (TFT) and Liquid Crystal Display (LCD) Monitors - Working principles of LCD projector and Touch Pad – Sound Card – Specification and Principles of working – Types

of UPS and Specification, Working principles and application – Measurements of UPS parameters – Verification of Back up time – Routine maintenance and Servicing.

Unit VIII: Maintenance and Trouble Shooting of Personal Computer (15 Questions)

Types of MODEM Installation and configuration – Different types of Add on cards – Recognizing POST error message code and rectification– Upgrading of PC – Updating of system software and application software – Safety precaution, preventive maintenance and Troubleshooting of PC – Parts and functions of Backup drives - ZIP Drive, Magneto Optical Disk (MOD) drive, CD Writer, and Troubleshooting – Introduction of TABLET / SMART Devices Working principles – Types of OS used in smart devices, Hardware and Software trouble shooting techniques.

Unit IX: Internet and Network Devices (15 Questions)

Internet and web browser – Search Engine – e-mail - Cloud Computing – Computer Networks – Network Topologies – Classifications - Communication media and connectors - OSI Model – Network devices – IP Addressing and protocols – video Calling and conferencing - Integrate wired and wireless networks – Surveillance using Network devices – Network security Threats and firewall Techniques.

Unit X: Server Configuration and Network Security (10 Questions)

Windows Server – Basic configuration and Installation – DNS and DHCP – Remote Access – RRAS policies – TCP/IP Routing – Web Server – Concept of Backup and Recovery – managing Network traffic – Problems of Internet Connectivity- Linux Server – installation and configuration – SWAT – Password Authentication – Telnet.

27. Trade - Machinist

(ITI Standard)

Code: 539

Unit I: General Safety Precaution and First Aid (10 Questions)

First aid – Floor Maintenance - Health Hazard – Safety and Road Signs – Electrical Safety – Fire Extinguishers – Introduction of Personal Protective Equipment's (PPE) – House Keeping – Disposal of Waste Materials.

Unit II: Basic Fitting (20 Questions)

Marking – Hacksawing – Chiselling – Surface Gauges – Surface Plate – Drilling – Vernier Height Gauge – Counter Sinking – Try Square – Divider – Types of Caliper - Punch and their uses - Uses of Different Types of Hamer – Use and Care of Marking Table – Elements of File – Types of Vice – Hacksaw of Frame with Blade – Files Specification and Grade – Tap and Die – Pedestal Grinder – Bench Grinder – Loading Glazing – Dressing – Truing – Radial Drilling – Cutting Speed and Feed of Drilling Machine – Inter Changeable Manufacturer.

Unit III: Gauges (15 Questions)

Scale – Surface Gauge – Universal Surface Gauge – Try Square – Depth Gauge – Combination Set – Marking Media – V Blocks – Angle Plate – Parallel Block – Vernier Height Gauge and their Parts – Limit and Fits – Inter Changeability – Grade and Tolerance - Vernier Caliper and Parts – Types of Micrometer with Parts – Dial test Indicators – Description and Uses of Sinebar and Slip Gauge – Screw Pitch Gauge. Geometrical tolerances – Definition - Symbol. Bore dial gauge and its parts, usage - Telescopic gauge.

Unit IV: Lathe Turning and Advanced Turning (40 Questions)

Lathe Parts – Cutting Tools – Driving Mechanism - Types of Lathe - Orthogonal and Oblique Cutting – Facing – Turning – Drilling – Boring – Grooving – Parallel Turning – Step Turning – Parting – Chambering – U cut – Reaming – Knurling – Types of Cutting Tools, Material, Shapes and Different Angles – Types of

Chip, Chip Breaker – Tool life – Driving Mechanism - Types of Taper – Taper Turning by Compound Slide and Offset Method - Vee Threads – Taper Turning Attachments – Mandrels - Centres and Elements – Thread Calculations – Single and Multi Start Threads – Lathe Centre – Lathe Plate – Driving Plate – Face Plate – Rests and their types and uses – Simple Gear Train and Compound Gear Train – Change Gears.

Unit V: Milling Machine (30 Questions)

Introduction of Milling Machine – Types – Parts – Construction and Specification – Different Milling Operations – Plain, Face, Angular, Form, Gang and Straddle – Up and Down Milling - Driving and Feed Mechanism – Types of Milling Cutters their uses and nomenclature - Operation – Attachment - Jig and Fixtures – Types and Uses of Jig and Fixtures - Physical Mechanical – Properties of Metal and Heat Treatment - Indexing Head and Types and Constructional Details - Calculation for Direct Simple Indexing – Grade of Tolerance – Vertical Milling – Helix and Spiral – Reamars.

Unit VI: Grinding and Tool and Cutter Grinding (30 Questions)

Introduction Grinding Wheel – Abrasive Types, Bond, Grade, Grid, Structure and Standard Marking of Wheel - Marking System – Types of Dresser – Glazing, Loading, Truing - Surface Quality – Roughness Value and their Symbol - Surface Grinder – Types, Parts, Construction uses – Specification and Safety - Cylindrical Grinder – Introduction Parts, Construction, Types, Specification – Wet Grinding, Dry Grinding and Various types of Grinding Wheel - Cutting Speed, Feed – Defects and Remedies - Tool and Grinder Cutter – Attachments. Introduction parts construction use and specification. Various methods of cutter grinding and their uses.

Unit VII: Computerised Numerical Control (CNC) Lathe (10 Questions)

Safety Elements – Functions – Feedback Control System – Operation and Tool bath – Coordinate Geometry – G Code and M Code – Program Modes – Insert Tool Holders - Cutting Speed and Feed – Writing Programme using simulator – Cutting Parameter - Work and Tool Offset, Hard and Safety Jaws – Modes - Edit Program – Important Keys and Norms - Offset – Tool Selection – Collision – Failure and Alarm Course.

Unit VIII: CNC Milling (VMC- Vertical Machining Centre) (10 Questions)

Safety – Functions – Control System – Tool bath – Polar Coordinates – G90 and G91 – Program – G Code – M Code – Sub Programming – Cutting Tool – Speed and Feed – Wear life – Parameter – Tool life – Stimulator Process Planning – Different Modes – Offset - Holding Fixtures – Modes of Operation – Editing – Entering Program – Switches and Buttons and Controls and Program first part – Over Travel – Operation and Effect – Collision – Thread milling - Offset – Emergency Stop – Program Transfer – Concept – Hour rate.

Unit IX: Repair, Overhauling and Slotting (15 Questions)

Lubricants – Lubricants System-types and Importance – Periodic Lubricants System Simple Repair Work - Maintenance – Definition – Types and its Necessity – Routine Maintenance with Checklist – System of Symbol and Colour Coding – Inspection of Machine Tools such as alignment levelling – Accuracy testing of machine tools such as Geometrical Parameters - Remedies of Equipments in Industries - Slotter – Classification – Driving and Quick Return Mechanism – Job Holding Devices – Spline Types and Uses.

Unit X: Advance Milling and Gears (20 Questions)

Spur gear – Rack gear calculation. Curves and their uses - Helix and spiral introduction types and elements - Types of gear calculation cutting helical gear. Reamer Types Calculation for Cutting – Twist Drill – Calculation for Cutting Tool - Cutting of Milling Machine Bevel gear – Cams – Worm wheel – Keys and their applications.

28. Trade - Manufacturing Process Control and Automation

(ITI Standard)

Code: 543

Unit I: Workplace Safety Regulations and Computers operations (10 Questions)

Workplace Safety - Basics of First Aid - Electrical Safety - Personal Protective Equipment (PPE) - Handling Emergencies: Power Failure, Fire and System Failures - 5S Concept and Its Industrial Applications - 5S Concept and Its Applications - Occupational Safety - Health and Environmental Regulations - Manufacturing Process and Automation.

Introduction to Computers - Windows Operating System (OS) - File Management - Computer Hardware - Software Specifications - Application - Software Installation.

Unit II: Manufacturing Processes and Automation (15 Questions)

Basics of Process Control and its industrial applications - Quality Control in Process Industries - Discrete Manufacturing and Applications - Continuous Manufacturing Process - Batch Manufacturing and Quality Testing.

Unit III: PLC Numbering Systems and Memory Organization (20 Questions)

Number Systems in Computer Architecture - Binary, Octal, Decimal and Hexadecimal Systems – Conversions - Programming Devices in PLC - PLC Program Development and Storage - Memory Unit and Control Actions in PLC.

Unit IV: PLC Applications and Selection Criteria (15 Questions)

Programmable Logic Controller (PLC) Basics - Functions of PLC – Logic - Timer - Counter - PLC Memory - Instruction Storage - On/Off Control - Sequencing in PLC – Arithmetic - Data Handling in PLC - PLC Block Diagram - Working Principle.

Unit V: PLC Input / Output Modules and Devices (25 Questions)

PLC Input and Output Modules - Signal Conversion and Isolation in Input/Output Modules – Input / Output Interface and Signal Conversions - Types of Input/Output Modules: DC, AC, AC/DC - Sinking and Sourcing in Input/Output Modules - Communication Between Input/Output and CPU - Input Devices - Push Buttons - Switches, Sensors - Output Devices – Indicators – Buzzers - Actuators - Types of Motors – DC Motor - Brushless Motor - Stepper Motors.

Unit VI: PLC Panel Wiring and VFD Operation (30 Questions)

Programmable Logic Controller (PLC) Panel Components – DIN Rail and Equipment Mounting - Cable Channel and Wire Connections - Power Supply – Switch Mode Power Supply (SMPS) – Transformer - Power Sockets - Control Devices – Relays – Contactors - Connectors - HMI, Selector Switch, Push Buttons, Indicating Lamps - Variable Frequency Drive (VFD) Basics - AC Motor Speed Control: Voltage vs Frequency - VFD Power Conversion and Function – Variable Frequency Drive (VFD) Components – Insulated Gate Bipolar Transistor (IGBT), Metal Oxide Semi-Conductor Field Effect Transistor (MOSFET), Microprocessor, Digital Signal Processing (DSP) - Working Principle of VFD.

Unit VII: PLC Ladder Diagrams and Advanced Instructions (30 Questions)

PLC Programming Basics - Types of PLC Programming Languages - Textual Languages - Instruction List - Structured Text - Graphical Languages - Ladder Diagram (LD) - Function Block Diagram (FBD) - Sequential Function Chart (SFC) - Ladder Logic (Relay Logic) - Basic PLC Programming Instructions- XIC and XIO Instructions.

PLC Timers – ON Delay Timer (TON) – OFF - Delay Timer (TOFF) - Retentive Timer (RTO) - Preset and Accumulated Values in Timers.

PLC Counters - Up Counter - Down Counter - Up/Down Counter - Trigger Inputs in Counters - Interpreting Timers and Counters in PLC Programming - Internal Instructions in PLC.

Unit VIII: HMI Installation, Configuration and PLC Interface (15 Questions)

Interfacing of PLC and HMI - Types of Communication Cables for PLC – Human Machine Interface (HMI) Connection - HMI Panel and Touchscreen Interface - HMI Application in Industrial Automation - Types of HMI Screens - Changing Screens and Viewing Process in HMI.

Unit IX: SCADA Operation, PLC Interface and Communication Networks (20 Questions)

Introduction to SCADA - SCADA System Architecture - Functions of Supervisory Control and Data Acquisition (SCADA) - SCADA Communication with PLCs and PID Controllers - Master Terminal Unit (MTU) in SCADA - Remote Terminal Unit (RTU) and Its Functions.

SCADA Data Communication and Network Protocols – Real Time Data Acquisition in SCADA - Information/Data Presentation in SCADA – Human Machine Interface (HMI) in SCADA - Monitoring and Control in SCADA.

Unit X: SCADA Architecture, HMI vs SCADA and Simulation (20 Questions)

HMI vs SCADA: Key Differences - SCADA as a Remote Monitoring System - HMI as a Local Monitoring Interface - Programmable Logic Controller (PLC) vs Distributed Control System (DCS): Understanding the Differences - Role of PLCs in Automation - HMI as a PC Based Interface - SCADA System Hardware Architecture - Client Layer and Data Server Layer in SCADA - SCADA Software Architecture – Real - Time Database in SCADA - Functions of SCADA Servers - Trending and Diagnostic Data in SCADA - SCADA for Maintenance and Logistics - SCADA with PLC interface Simulation.

SCADA Project Import and Export (CSV File) - Open Database Connectivity (ODBC) in SCADA - Multi-Language Switching in SCADA - Project Archiving and Retrieval in SCADA - SCADA Simulation: Simple Heat Exchanger - SCADA Simulation: Chemical Reactor.

29. Trade - Mechanic Auto Body Repair

(ITI Standard)

Code: 541

Unit I: General Safety Precaution First Aid (10 Questions)

Importance of safety – Basic need of Personal Protective Equipment (PPE) – First Aid – Safe Disposal of used engine oil – Hazard Identification – Safety signs for Danger Warning – Personal Safety – Fire Extinguishers – safe handling of Fuel Spillage – Safe disposal of toxic dust – Testing of Lifting Equipment – Energy saving Tips / Audit of ITI Electricity Usage.

Unit II: Fasteners, Cutting Tools, Hand Tools and Power Tools (20 Questions)

Measuring & Marking tools – Hand Tools –Cleaning tools- Scraper –Surface plates - Try square – Callipers inside and outside – Dividers - Cross-cut - Hammer - Lump – Mallet - Different type of body hammers - Dolly block – Spoon body picks - Body pullers and pull rods - Suction cup - Scratch awl – Multi grip - Tinsnips sheet metal cutting pliers - (Aviation snips) – Panel cutters - Trim and upholstery tools - Door handle tool (clip pullers) - Different type of files – Sanding board - Sanding block - Spreaders and squeegees - Air powered tools Advantage over electrical powered tools - spray gun - Disc type and dual action (finishing) sander - air grinders - Air saw - Air scraper - Air impact wrench - Air ratchet - Air drill - Spot welder mover air drill - Spot weld cutter Drill type & Hole saw type - Air chisel – Air blow gun - Spray

guns – wrenches - Torque wrenches Types of Jack - Frame rack - Maintenance of hydraulic tools - Hydraulic lifts - Engine crane -Lock rings – Keys Split pens – Hacksaw – Files – Grinding – Chisel – Removal of Stud and bolt- Measuring practice – Practice on cutting.

Unit III: Drilling Machine, Hand Reamers & Sheet Metal Operations (10 Questions)

Bench type Drilling Machine – Portable electrical Drilling Machine – Hand Taps – Die and Die stock – Hand Reamers – Sheet metal joints – Shearing – Bending – Drawing – Riveting – Soldering – Brazing – Wire gauges – Blow lamp – Marking and Drilling clear and Blind Holes.

Unit IV: Electrical and Electronics Components (10 Questions)

Principles - Ohm's law Voltage – Current – Resistance – Power – Energy – Voltmeter - Ammeter, Ohmmeter - Multi meter - Conductors & Insulators – Wires - Introduction to Hydraulics & Pneumatics Components – Definition of Pascal law – pressure – Force - Viscosity – Pneumatic Symbols.

Unit V: Vehicle Specification (20 Questions)

Identification of different type of Vehicle – Service station Equipment – Vehicle hoists – Types of body – Parts of Unibody design vehicle – Under body front and rear section – Structural components – Sports utility vehicle – Service manuals – Collision repair guides – Vehicle Construction Technology – Repair Order – Description of Vehicle body and chassis – Vehicle Frame – Classification of IC engines - Front Engine front wheel drive – Rear engine rear wheel drive Mid-engine rear – Unibody Design Factors.

Unit VI: Maintenance of Air Compressor (20 Questions)

Overhauling of Air compressor – Service FRL unit – Check the Oil level- Check the Oil filter – Check and align a loose motor pulley – Types of Compressors – Compressor Accessories – Two stage rotary screw air compressor – Air and fuel control equipment – Colour coding of airlines water line and fuel line.

Unit VII: Welding and Cutting Equipments Sheet Metal Repair (20 Questions)

Air system Maintenance Oxyacetylene welding – MIG welding – Clamping and MIG welding of sample panel – Plug welding – Stich welding – Spot welding – TIG welding – Brazing – MIG welding equipments – Welding Techniques – Welding defects – Resistance spot welding – Operating a squeeze – Tack weld – Stich weld – Lap weld – Butt welds Practice on Minor Repair of damaged car -Type of HSS - Type of Loading – Classifying body damage – Metal Straightening technique – Method of paint removal – Straightening aluminium with Hammer – Filling and Grinding aluminium – Dent removal – Body Filler application & sanding to ensure body repair – Maintenance of single action sander – Hammer and dolly straighten damage on a door – Identify the Minor damage of Vehicle.

Unit VIII: Evaluate and Repair Damaged Plastic Part, Glasses and Door Fitting Repairing Process (35 Questions)

Identify the thermoplastics – Common automotive plastics – Using chemical adhesive – Using Heat to reshape plastics – Repair Common automotive plastics – Airless plastics welding – Ultrasonic plastic welding – Plastic welding techniques – Plastic stich welding – Reinforced plastic repairs – Hood removal – Hood adjustments – Bumper replacements – Fender removal, installing – Trunk lid adjustments – Removing windshield – Door Removal Practice – Door glass adjustments – Identify the passenger compartments – Seat services – Air and water leakage test – Type of Glasses – Windshield rubber gasket service – Service doors- door construction -Window Regulator service – Door Glass adjustments – Station wagon- Tailgate adjustments – Roof panel service – Carpeting service - Interior trim service – Dash panel service – Water leak checking.

Unit XI: Structural Collision Damage and Measuring systems (35 Questions)

Use of Trame gauge – Measurement of the body damages – Gauge measuring system -Inspecting of damage from passengers and Luggage – Computerized Measuring system - Collision Repair process – Mash damage – Passengers and Luggage dimensions – Visually Determining the extent of impact damage

– Measuring system - Tram gauges – Digital Tram gauges – Centering Gauges – Unibody Vehicles – Primary damage – secondary damage – Collison damage – Impact and its effect on a vehicle – Measurement of the body side panel – Measurement of the rear body – Digital Tram gauges – Diagnosing damage – Central panel – Zero planes.

Unit X: Frame Straightening Equipments, Re-alignment Procedures, Vehicle and Occupant safety (20 Questions)

Analysing damage – Length – Width – Side – Twist – Diamond – Strut – Unibody / Frame alignment – Rollover damage – Visualizing front and Collisions – Bench straightening system – Structure alignment procedure Unibody frame re alignment – Seat assemblies – Steering Column assembly – Carpeting weather stripping – Glass trim panels – Cluster service – Headliner service – Console service.

30. Trade – Mechanic Electric Vehicle (MEV)

(ITI Standard)

Code: 542

Unit I: Safety Precautions in Auto Workshop, First Aid, hand Tools, Workshop Tools and Equipment (15 Questions)

Safety - General Precautions observed in the Industry / Shopfloor - First aid - Operation of Electrical Mains and Electrical Safety - PPEs - Response to Emergencies e.g. - Power Failure – Fire - System Failure - Housekeeping and Good Shopfloor Practices - 5S Concept and its Application - Occupational Safety and Health: Health, Safety and Environment guidelines, Legislations and Regulations - Basic Understanding on Hot Work, Confined Space Work and Material Handling Equipment - Vehicle Hoists – Two Post and Four Post Hoist - Engine Hoists - Mechanical Jacks - Hydraulic Jacks – Stands.

Unit II: Automobile Vehicle Types and their Specifications (10 Questions)

History of Automobile - Evolution and Growth of the Industry - Key Automobile Companies and their Products - Brief Description of Components and their Locations - Classification of Automobiles based on Various Aspects and Determining the Reason (Commercial, Passenger), Product Segments (Criteria for Vehicle Types, Variants and Versions, Markets: India, EU and US).

Unit III: Electrical Circuits and Test their Parameters by using Electrical Measuring Instruments (15 Questions)

Basic Electricity - Electricity Principles - Ground Connections - Ohm's Law – Power – Energy - Voltmeter, Ammeter, Ohmmeter, Mulitmeter Conductors and Insulators - Wires, Shielding, Length vs resistance, Resistor Ratings - Capacitors and Coils Fuses and Circuit Breakers, Ballast Resistor, Stripping Wire Insulation - Cable Colour Codes and Sizes - Resistors in Series Circuits - Parallel Circuits and Series-Parallel Circuits - Electro Static Effects - Capacitors and its Applications - Capacitors in Series and parallel, Cells in series and parallel, Magnetic Effects - Heating Effects - Thermo-Electric energy – Thermistors - Thermo Couples - Electrochemical Energy - Photovoltaic Energy - Piezo Electric Energy - Electromagnetic Induction - Relays, Solenoids - Primary and Secondary Windings in Transformers, Stator and Rotor Coils in Motor - Basics of AC & DC - Various terms such as +ve Cycle, -ve Cycle – Frequency - Time Period – RMS – Peak - Instantaneous Value - Single Phase and Three Phase supply - Terms like Line and Phase voltage/ Currents – Insulators - Conductors and Semiconductor Properties - Different type of Electrical Cables.

Unit IV: Electronic Circuits and Analyse Their Circuit Functioning (15 Questions)

Basic Electronics - Electrical and Electronic Components - Switches - Normally Open, Normally Closed - Single Pole Single Throw Switch (SPST) - Ganged, and Mercury Switches Used in Automobile Circuit - Relay, ISO Relays, Solenoids, Buzzers – Resistors - Different Type of Resistors and Their Colour Codes

- Fixed, Stepped, and Variable Resistors, Rheostat, Potentiometer - Diodes - Diode Identification and Ratings - Zener Diodes - Avalanche Diodes - Light Emitting Diodes - Photo Diodes And Clamping Diodes – Transistors - NPN, PNP, Field-Effect Transistor (FET), IGBT, Phototransistors - Integrated Circuits - Circuit Protection Devices - Different Type of Fuses - Glass or Ceramic - Blade And Bullet or Cartridge Fuses - Fusible Links, Maxi Fuses, Circuit Breaker, Positive Temperature Coefficient (PTC) Resistor, Device, Logic Gates-OR, AND & NOT And Logic Gates Using Switches - Input and Output Interfacing - PWM Generation.

Unit V: Electric Vehicle Components and Comparison of EV and IC Engine Vehicles based on Performance (25 Questions)

Electric Vehicle Technology - EV Terminology Comparison of Electric Vehicle With IC Engine Vehicle Based on Emissions, Range, Fuel Type - Types of Electric Vehicle, (Battery Electric Vehicle) BEV, (Hybrid Electric Vehicle) HEV, (Plug-in Hybrid Electric Vehicle) PHEV and (Fuel Cell Electric Vehicle) FCEV - Lux Meters - Performance Parameter, Basics of Motors, Selection, Sizing and Characteristic of Motor - Calculation for Motor Effort, Electric Transmission - Principle, Working and Operation of Propulsion System - DC Motor - Drives Armature Voltage, Chopper Circuit, Step Up, Step Down Chopper, Control Strategy, Chopper Amplifier - Brushless DC Motor Principle Working, Features, Speed Control System of Brushless DC Motor, Efficiency, Calculation.

Unit VI: **Automobile Systems and Subsystems (20 Questions)**

Various Automotive Systems and Subsystems - Power Train - Engines and its Types - Transmission and Driveline Systems - Chassis System: Chassis and Monocoque Body, Steering Systems, Suspension System (Its Functions and Different Components, Different Types Like Double Wishbone - Trailing Twist Axle Suspension, Macphersons Rut Suspension, Multi-Link etc) - Tyres and Wheels - JATMA/ATMA/ETRTO Standards - Tyres and Wheels Markings - Tyre Selection Considerations for Automobile, Tyre Designs Diagonal vs Radial Ply, Tubed vs Tubeless, Wheel Alignment - Working and Construction of Automatic Transmission System (Single Speed Reduction Gear) Body Engineering: Styling, Exterior, Interior, Trims etc. Vehicle Integration – (Diesel Multiple Unit) DMU, Ergonomics, Layout and Packaging Studies.

Unit VII: Battery Pack Components, monitor and check performance of high voltage rechargeable energy storage system and Battery Management System (20 Questions)

Cells - Cell Types Lead Acid/Lithium-ion polymer/liquid cooled lithium-ion heating system/Li-ion/NiMH, NiCad etc., Chemistries and Geometries, Cell Selection and sizing, Handling Cells, Understanding Cell Charging and Discharging Curves, Understand Temperature impact on cell, Internal resistance, Cell Construction and Manufacturing, Life cycle of various types of batteries Battery Module and Pack Development - Battery Pack Configuration, Pack and Module Construction, Configurations, Types and Energy Concepts, Voltage, and Temperature Measurement, Current Measurement, Thermal Management, Pack Sealing Sensors used in BMS Battery capacity and rating Battery charging and discharging calculation. Battery Management System (BMS)/Energy Management System (EMS) - Need of BMS, Voltage, Current and Temperature Monitoring, Cell Balancing - Types, Active, Passive, SoC Determination, SoC Algorithms, Battery cooling System.

Unit VIII: Test and Troubleshoot Accessory and Auxiliary Components - Power Steering, Braking and HVAC Comfort System (30 Questions)

EV Thermal Management Cooling of Battery Pack - Motor and Inverter, Active and Passive Cooling - Fluid Based Cooling - Ethylene Glycol - Forced Air Cooling - Cabin Air Based Cooling Description of Electric Power Assisted Steering - Basic Electric Power Steering Operation - Electronic Adjustable - Rate Shock Absorbers, Brakes – Mechanical, Hydraulics and Air Brake System - Drum Wheel Brake - Disc Wheel Brake System - Electric Brakes, Electro Hydraulic Braking (EHB), ABS Brake System, Antilock Braking System Operation, Principles of ABS Braking, ABS Master Cylinder, Hydraulic Control Unit, Wheel Speed Sensors - ABS With Electronic Brake Force Distribution (EBD) Control Unit - Heating Ventilation Air

Conditioning (HVAC) Legislation - Vehicle Heating, Ventilation and Cooling Systems - Basic Air Conditioning Principles - Air Conditioning Capacity - Air Conditioning Refrigerant – Humidity - Fixed Orifice - Control Devices - Thermostatic Expansion Valve - Thermal Expansion Valves - Air-Conditioning Compressors, Condensers and Evaporators, Receiver Drier, Lines and Hoses, Txvalve Construction – Temperature - Monitoring Thermostat, Refrigerants - Pressure Switches, Heating Elements - Air-Conditioning ECU, Ambient Air Temperature Sensor, Servomotors - Electric Servomotors, Automatic Climate Control Sensors, Evaporator Temperature Sensor - Blower Speed Control - Ventilation Systems Electric Inverter Compressor.

Unit IX: Checking and Troubleshooting of Wiring Circuits – HV and LV and The Electrical Components in The Electric Vehicle (20 Questions)

Wiring and Circuit Diagrams Automotive Wiring - Primary Wiring and Secondary Wiring - Comparison between Solid and Stranded Primary Wire - Wire Size - Metric and American Wire Gauge (AWG), Importance of Ground Straps Used in Automotive Wiring - Different Type of Terminals and Connectors Molded - Multiple-Wire Hard Shell – Bulkhead - Weather Pack, Metri-Pack, Heat Shrink Covered Butt Connectors - Printed Circuit Boards - Wiring Harnesses, Wiring Diagrams and Color Codes and Circuit Numbering - Common Electrical and Electronic Symbols - Horn Circuit, Wiper Circuit - Power Window Components and Circuit - Power Door Lock Circuit, Automatic Door Lock Circuit - Remote Keyless Entry System Circuit - Antitheft System - Immobilizer System - Navigation System - Car Infotainment System – Airbags – Seatbelt - Vehicle-Safety Systems - Crash Sensors - Seat Belt Pre Tensioners - Tyre Pressure Monitoring Systems - Integrated Communications - Proximity Sensors - Reflective Displays - Global Positioning Satellites – Triangulation / Trilateration – Telematics - Application of Automotive Bus System - CAN (Control Area Network) - LIN (Local Interconnect Network) - MOST (Media Oriented Systems Transport) - High Voltage Elements - PDU, Voltage Converters - Switching Devices - HV – Diagnostics and Troubleshooting - HV Cabling – Repair - Safety Certification, HVIL, Isolation Testing Power Electronics Inverter and Voltage Converters, Scan Tool and Reading Vehicle Diagnostics.

Unit X: Battery Testing, Charging and Cycling Operations-Selecting, Operating and Troubleshooting of Electric Vehicle Charging Ecosystem (30 Questions)

Charge and Discharge Cycles - Understanding State of Charge and State of Health - Battery Life - Cycles of Operation - SoH, Concept of State of Energy (SoE) and State of Power (SoP) Battery Handling at Swapping Stations - Charging System- The Purpose of Charging System - Charging System Components - Charging System Circuit - AC Charger, DC Charger - Solar Integrated (MPPT Based) Charger High Voltage Charging Systems - Charger Cooling - Constant Current (CC) & Constant Voltage (CV) Charging Standard -Chademo, GB/T, DC001, CCS –Protocols - Connectors Electric Vehicles Charging Station - Type of Charging Station - Selection and Sizing of Charging Station - Components of Charging Station - Terms Associated with EV Charging Station Charging Station Indicators - Charging Station Installation - Charging Station for Swappable Battery Packs DC/DC Converter - Working Principle – Type – Calculation - Relay, Operation, Types and Application - Rule Based and Optimization Based Control - Software Based Control - Thermal Management System - Cell Load Distribution - SOC and SOH Determination - Repair and Maintenance of Electric Vehicle System - Chopper Circuit of DC Motor - Using Second Life Batteries - Selection, Redeployment, Refurbishment Battery Disposal, Storing Batteries.

31. Trade - Mechanic Motor Vehicle (MMV)

(ITI Standard)

Code: 437

Unit I: Safety Precautions and First Aid (10 Questions)

Importance of Safety and general Precautions to be observed in the shop. Basic first aid, safety signs. Safe handling of Fuel Spillage, Fire extinguishers and its types. Different types of fire. Safe disposal of toxic dust, Safe handling and Periodic testing of lifting equipment, Authorization of Moving & road testing vehicles. Electrical safety tips.

Unit II: Hand Tools and Measuring Instruments, Frame and Body (20 Questions)

Marking materials, Cleaning tools, Workshop tools, Common and Special hand tools, Micrometers, Vernier calipers, Telescope gauges, Dial bore gauges, Dial indicators, Straightedge, Feeler gauge, Thread pitch gauge, Vacuum gauge, Tire pressure gauge. Drill bits, Drilling machines and holding devices, Taps and Die sets, Calculation of Tap drill sizes for metric and inch taps. Screw extractors, Hand Reamers and its types. Lapping, Lapping abrasives, Type of Laps. Fasteners.

Function of frame, Types of frame, Chassis repair and alignment, Frame maintenance, Safety standards for cars.

Unit III: Engine, Transmission system, Fuel supply system, Cooling systems and lubrication system (80 Questions)

Internal & External combustion engines, Classification of IC engines, Principle & working of IC engines. Differentiate between 2- stroke and 4 stroke, C.I engine and S.I Engine, Direct injection and Indirect injection, Engine Technical terms, Engine specification, Various gauges/instrument on a dash board Petrol Engine. Engine Components and materials: Cylinder head, combustion chambers, Head gaskets, Engine Valves & Valve Trains, Type of valve operating mechanism, Valve - timing diagram, Camshafts & drives, Timing belts & chains, Timing belts tensioners. Pistons, Piston rings and Piston pins. Compression ratio, Connecting rod, Crank shaft, Engine bearings, Fly wheel and vibration damper. Crank case & oil pump, Gears timing mark, Chain sprockets, Chain tensioner etc. Function of clutch & coupling units attached to flywheel. Cylinder block, Sleeves (liner). Intake & Exhaust systems and Components, Firing order of the engine.

Clutch, Gear ratios, Gearbox Automated Manual Transmission (AMT) Gearbox layout & operation, Baulk-ring synchromesh unit, Transaxle synchromesh unit drive transfer case, Freewheeling hubs, Four wheel drive differentials All-wheel drive- four wheel final drives, All-wheel drive transfer case, Transfer case differential action Automatic Transmissions - Torque converters, Planetary gears, Electronic control transmission, Propeller shaft, Universal Joint, Final drive, Differential unit, Rear axle & Front axle.

Fuel characteristics, concept of Quiet diesel technology & Clean diesel technology. Diesel fuel system components – Description and function of Diesel tanks & lines, Diesel fuel filters, water separator, Lift pump, Plunger pump, Priming pump, Electronic Diesel control Electronic fuel control systems, Common Rail Diesel Injection (CRDI) system, Sensors, actuators and ECU (Electronic Control Unit) used in Diesel Engines, Gasoline Fuel Systems, Stoichiometric ratio, Air density, CNG –Gas circuit components.

Different type of cooling systems, components - Radiator, Coolant hoses, Water pump, Cooling system thermostat, Cooling fans, Temperature indicators, Radiator pressure cap, Recovery system, Thermo switch. Functions of oil, Viscosity and its grade as per SAE, Oil additives, Synthetic oils, The lubrication system, Splash system, Pressure system, Corrosion/noise reduction in the lubrication system. Lubrication system components - Description and function of Sump, Oil collection pan, Oil tank, Pickup tube, different type of Oil pump & Oil filters Oil pressure relief valve, Spurt holes & galleries, Oil indicators, Oil cooler.

Unit IV: Wheels & Tyres, Steering Systems, Suspension Systems, Braking Systems (30 Questions)

Wheel, Tyre, Rim and is types, materials, Construction, Characteristics. Tyre sizes & designations, Tyre information, Tyre tread designs, Tyre ratings for temperature & traction. Descriptions Tire wear Patterns and causes Nitrogen v/s atmospheric air in tyres

Principles of steering, Rack-and-pinion steering system, Recirculation ball & nut steering system, Four-wheel steering systems, collapsible steering system. Steering boxes & columns, Power Assisted steering, Electric power assisted steering. Wheel alignment:- Basic principles , wheel base, wheel track, king pin inclination, Caster, Camber, Scrub radius, Toe-in & toe out, Toe-out on turns, Turning radius, Thrust angle & centre lines.

Principles of suspension, Types of suspension Independent suspension, Rear independent suspension, Rear-wheel drive independent suspension, non independent suspension, electronically controlled air suspension (ECAS), Adaptive air suspension operation. Types of springs - Description and function of Coil springs, Leaf springs, Torsion bars, Rubber springs. Shock absorber types- Hydraulic shock absorbers, Gas-pressurized shock absorbers, Load adjustable shock absorbers, Manual adjustable-rate shock absorbers, Electronic adjustable-rate shock absorbers, Automatic load adjustable shock absorbers Front suspension types & components - Mc person Strut suspension, Short/long arm suspension, Torsion bar suspension Rear suspension types & components -Rigid axle leaf spring suspension, Rigid axle coil spring suspension, Independent type suspension, Rigid non-drive suspension.

Brake type - principles, Air brakes, Exhaust brakes, Electric brakes, Parking brakes, Engine brakes, Regenerative braking Braking system. Components brake system. Brake friction materials. Antilock braking system operation, Principles of ABS braking, CABS master cylinder, Chydraulic control unit, Wheel speed sensors, ABS with EBD electronic control unit. The construction and Operation of ABS. Braking system components.

Unit V: Diagnostic Trouble Code (DTC) (10 Questions)

Use of scan tool and retrievals of codes. EFI sensors - Intake Temperature sensor, Mass airflow sensor, Manifold absolute pressure sensor, Air vortex sensor, Fuel system sensor, Throttle position sensor, Exhaust gas oxygen sensor, Crank angle sensor, Hall effect voltage sensor, Optical type sensors.

Unit VI: Emission Control (10 Questions)

Vehicle emissions Standards - Euro and Bharat II, III, IV, V Sources of emission, Combustion, Combustion chamber design. Types of emissions: Characteristics and Effect of Hydrocarbons, Hydrocarbons in exhaust gases, Oxides of nitrogen, Particulates, Carbon monoxide, Carbon dioxide, Sulphur content in fuels Description of Evaporation emission control, Catalytic conversion, Closed loop, Crankcase emission control, Exhaust gas recirculation (EGR) valve, , Controlling airfuel ratios, Charcoal storage devices, Diesel particulate filter (DPF). Selective Catalytic Reduction (SCR), EGR VS SCR.

Unit VII: Battery (15 Questions)

Magnetic effects, Heating effects, Thermoelectric energy, Thermisters, Thermo couples, Electrochemical energy, Photo-voltaic energy, Piezoelectric energy, Electromagnetic induction, Relays, Solenoids, Primary & Secondary windings, Transformers, stator and rotor coils.

Basic electronics: Description of Semi conductors, Solid state devices- Diodes, Transistor, ignition systems - Distributor less ignition systems, Insulated coils, Distributor less ignition system timing. Horn, Wiper, power window Power door lock, Automatic door lock, Remote keyless entry system, Antitheft system, Immobilizer system circuits and its components. Description and function of Airbags, Seatbelt, Vehicle safety systems, Crash sensors, Seat belt pre tensioners, Tire pressure monitoring systems Integrated communications, Proximity sensors.

Unit VIII: Heating Ventilation Air Conditioning (HVAC) (10 Questions)

Principles, Air-conditioning capacity, Air-conditioning refrigerant, Humidity Description and function of Fixed orifice, Control devices, Thermostatic expansion valve system, Thermal expansion valves, Air-conditioning compressors, Condensers & evaporators, Receiver drier, Lines & hoses, TX valve construction, Temperature monitoring thermostat, Refrigerants, Pressure switches, Heating elements Air-conditioning ECU, Ambient air temperature sensor, Servo motors, Electric servo motors, Automatic climate control sensors, Evaporator temperature sensor, Blower speed control, Ventilation system

Unit IX: Basic Electrical and Electric Vehicle Technology (10 Questions)

Electricity principles, Basic Electrical connections, Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter, Mulitmeter, Conductors & insulators, transformer, Wires, Shielding, Length vs. resistance, Resistor ratings Fuses & circuit breakers, Ballast resistor, Stripping wire

insulation, cable colour codes and sizes, Resistors in Series circuits, Parallel circuits and Series-parallel circuits, Electro static effects, Capacitors and its applications, Capacitors in series and parallel.

Description of charging circuit operation of alternators, regulator unit, ignition warning lamp troubles and remedy in charging system. Description of starter motor circuit, Constructional details of starter motor solenoid switches, common troubles and remedy in starter circuit.

Introduction to Hybrid & Electronic vehicle, Hydrogen fuel cell vehicle, EV Terminology Comparison of Electric Vehicle with IC engine vehicle based on emissions, range, fuel type. Types of electric vehicle, BEV, HEV, PHEV and FCEV. Architecture of Electric Vehicle, working principle of fully electric vehicle, Major component, performance parameter, Basics of Motors, Selection, sizing and characteristic of Motor, calculation for motor effort, electric transmission. Principle, working and operation of propulsion system, DC Motor - Drives Armature Voltage, chopper circuit, step up, Step down chopper, control strategy, chopper amplifier. Brushless DC Motor – principle working, features, speed control system of brushless DC motor, efficiency, calculation. Battery management system.

Unit X: Traffic rules (5 Questions)

Signals & controls. Locating vehicle information, Obtaining & interpreting scan tool data.

32. Trade - Mechanic Two and Three Wheeler

(ITI Standard)

Code: 553

Unit I: General Safety Precaution and First Aid (10 Questions)

Environment regulation – housekeeping - workshop safety – fire extinguishers – electrical safety tips - energy saving tips – periodic testing of lifting equipment – authorization of moving and road testing vehicle - safe disposal of toxic dust.

Unit II: Marking and Laying Out Workshop Tools and Accessories (20 Questions)

Measuring tools – Steel rules – callipers dividers – surface gauges, punches – chisel – hammers, screw driver, Allen keys, spanners – Socket and accessories – Pliers air impact wrench – Torque wrenches. Car jet washers – Pipe flaring and cutting – Tools, pullers – Vernier calliper ,micro meters (outside and depth) – dial bore gauges, dial indicator, feeler gauges, telescope gauges, thread pitch gauges – vacuum gauges – tyre pressure gauges.

Types of screws, nuts, studs and bolts, locking devices, split pins, circlip, locking rings. Function of gasket, oil seals – cutting tools – drilling machines – taps and dies – reamers –- screw extractors - gas welding.

Unit III: Electric Circuit, Batteries, Measuring Instrument and Battery (20 Questions)

Electrical circuit – Electrical measuring instruments – Voltmeters, ammeter – series, parallel, series parallel using ohm's law – Colour Coding of Resistors – Resistor in series circuit – Series and Parallel in capacitor – Capacitor and its application – Voltage drop using multimeter – Current flow measurement by multimeter – Stripping wire insulation – Ballast resistor - Fuses and circuit breakers – Batteries and cells, lead acid batteries, Stay Maintenance Free (SMF) batteries – Testing battery with Hydro meter – Testing of battery – Testing of Relay and Solenoid – Causes of excessive key – of battery drain - Primary and Secondary cells – relays – electrical testing in two and three wheels – battery testing, charges – Thermistor – Thermocouples.

Unit IV: Vehicle Specification and General Servicing (20 Questions)

Auto industry - different types of vehicle – leading manufacturers – trend, new product – automatic research association of India – classification on basis of load as per central motor vehicle rule - wheels,

final drive and fuel used, axles – position of engine - steering – transmission, body load – vehicle hoists – vehicles specification data, identification of vehicle information number

Parts and general service of two and three wheeler – washing, oiling, cleaning and lubricating – garage and service station equipment - checking engine bore, piston ring, connecting rod, bearing crankshaft – adjust chain tension - check electric system – Internal and external combustion engine – two and four stroke engine – Compression Ignition Spark Ignition (C.I.S.I) engine – various gauges- instrument – speedometer, tachometer, odometer and fuel gauge and indicators

Unit V: Engine Overhaul, Cylinder Head Trouble Shoot in Smoke, Engine Overheating Abnormal Voice (30 Questions)

Basic engine components – cams - piston and piston rings – recommended clearances and its necessity, common troubles remedies of piston. Connecting rod – Piston pin and materials clearances for rings – crank shaft – engine bearings – trouble shooting of low compression high compression - excessive noise and poor idling.

Engine Head Assembly: Engine valves – materials. Valve Mechanism – valve seats – valve timing – cam shaft – timing belts and chains – trouble shootings of excessive Smoke – overheating – knocking –cam chain noise and its slack.

Intake and exhaust – carburettor – type – operation – filter diesel fuel injection – Tanks and lines. Idle speed – slow speed, high speed, air cleaner – Intake manifold – Cooling and lubrication system engine oil grades – lubrication points – trouble shooting.

Unit VI: Fuel Tank, Liquefied Petroleum Gas (LPG) / Compressed Natural Gas (CNG) Fuel

(15 Questions)

Gasoline fuel – controlling fuel burn – fuel ratio (air-fuel) fuel supply system – trouble shooting –power engine of three wheeler – safety handling gas unit – emission control. Hydrocarbons in exhaust – carbon monoxide. Sulphur content in fuels – Crank case emission control – evaporative emission control – catalytic converter.

Unit VII: Steering Suspension System, Front and Rear Wheel Brakes (25 Questions)

Steering – principle – types – function of steering system - suspension system component – principles, suspension force, description, location, working principle of telescopic front suspension, suspension oil – shock absorber types – hydraulic, gas –pressurized, load-adjustable, manual adjustable, automatic load adjustable.

Automatic / manual transmission wheel construction – wheel type – size radial ply tyres – tubeless tyre – Tyre pressure and life – Tube size, puncture procedure – Tyre construction – Tyre material, size, tyre information, tyre thread designs – Wear pattern.

Braking system - fundamentals, principles, components - Drum and disc brakes – advantage, master cylinder, Hydraulic pressure brake pad – Brake pedal, Brake fluid hose – bleeding, applying brake force – brake light switch – Pad material – ABS drum brakes – inspect and servicing of all braking system.

Wet and dry clutches – clutch types, chain mechanism – gear shift mechanism – gear ratio – gear drive position – trouble shooting – clutch slip clutch not disengage – Hard to shift pedal not return jumps of gears – automatic transmission – gear shift linkage disassembly, inspection and assembly of gearshift linkage

Unit VIII: Electronic Circuit and Testing A/C Generator (20 Questions)

Basic electronics – Semi conductor – Diodes – Types of Diodes - Transistors – Testing of PNP and NPN Transistor - Regulator / Rectifier Checking and Assembling –Thyristors – Unit Junction Transistor (UJT), Metal oxide field effect transistors (MOSFETS) switches – logic gates (OR, AND, NOT) – logic gates using switches – Continuity Tester.

Thermistor – Ignition switch. Alternator – Regulator / rectifier Battery Power Source – Ignition coil contact breaker – capacitor – condenser – high tension leads. Spark plug – plug components - electronic ignition – starter motor – fuse – throttle position switch – charging system – starting system – lighting system – circuit diagram – wiring harness – bulb – types – specification.

Unit IX: Checking of Ignition Circuits (20 Questions)

Spark plug gap and adjustments – ignition primary and secondary coil – A.C generator, practice on removal of C.D.I unit (Capacitive Discharge Ignition), inspection of C.D.I unit and assembling – servicing of electronic ignition system – Inspection of ignition timing and adjustment – inspect ignition switch, handlebar switches, front brake and rear brake stoplight light switch.

Trouble shooting

i. No spark at plugs engine starts but runs poorly

ii. No lights comes on when ignition switch

iii. Ignition switch is turned on

iv. Head light beams – H1-LO switch is operated – misfiring.

v. F1 system – Various – IAP, MAO, OXYZEN, TA – fuel injector

Unit X: Servicing and Maintenance of Electric Two and Three Wheelers (20 Questions)

Electric vehicle architecture design electric drive and controller – electric drive and controller – Energy Storage Solutions (ESS) – Battery Management System (BMS) – Energy Management System (EMS) – Control Unit (CU) – tools, test equipment and service procedure of EV – Diagnose, repair and test power electronic circuit, control electronic hardware – safe storage of battery.

33. Trade – Operator Advance Machine Tools

(ITI Standard)

Code: 544

Unit I: Safety (5 Questions)

Safety and General Precautions in Industry/Shop floor - Personal Protective Equipments (PPE) - First Aid – Operations of Electrical Mains and Electrical Safety - Occupational Safety and Health Safety – Safety Signs – Response to Emergencies – Importance of House Keeping – 5S Concepts – Material Handling - Lifting and Handling Loads – Moving Heavy Equipments.

Unit II: Basic Fittings and Maintenance (20 Questions)

Purpose, types, description of Vice – Divider – Scriber – Marking Block – Micrometer – Vernier Caliper – Vernier Height Gauge – Surface Plate and Angle Plate - Combination set - Vernier bevel protractor - Bench Grinder - Hack saw and Hack saw blade – Hammer – Drills - Drilling Machine and its operations - Taps and Tapping - Screw drivers – Spanners – Socket – Tubular - Hook Spanner – Wrenches - T-socket – Ratchet - Pipe Wrenches – Sheet Metal Types and Use Snip and Stake – Method of lap and Butt Joints Using Dolly and Snap – Pipe Cutters – Method to Bend in Hot and Cold Condition using fixtures – Rivets and Riveting types - Precautions to be Observed and Method to Use Drift, Pullers and Extractors.

Unit III: Turning (25 Questions)

Turning - Types - Construction Features Working Principles – Functions - Use Accessories and Attachments of Lathe Machine - Driving Mechanism – Cone Pulley - All Geared Headstock – Quick - Change Gearbox And Apron Mechanism – Types - Materials and Angles of the Lathe Cutting Tools -

Purpose and Method to Perform Various Lathe Operations - Using Accessories and Attachments - Determination and Use of Cutting Speed – Feed - Coolant and Its Applications - Lubrication System - Taper Turning Methods and Attachment – Boring - Step Boring and Taper Boring in a Blind Hole - Eccentric Turning – Threads - Procedure for Cutting Various Internal and External Screw Threads.

Unit IV: Grinding (15 Questions)

Grinding - Types – Construction – Features - Working Principle - Functions and Use of Surface and Cylindrical Grinding Machine - Grinding Wheels and their Specifications - Grinding Wheels for Balancing and Truing - Method to Hold Work and Grind Wheel - Various Grinding Operation Selecting Proper Speed – Feed – Coolant – Faults - Their Rectification and Preventive Maintenance of Grinding Machine - Study of Hydraulic System.

Unit V: Milling (25 Questions)

Milling – Types – Accessories – Attachments – Work Holding Devices – Types of Cutters – Milling Operations – Plain Milling – Step Milling – Angular Milling – Slot Milling and Groove Cutting - Gears – Gear Nomenclature – Gear Cutting – Gear Cutting Calculations - Indexing – Procedure for Various Gears – Helical Gears – Bevel Gears – Rack – Worm and Worm Wheel.

Unit VI: Interchangeable System and Gauges (30 Questions)

The Elements of Interchangeable System Basis Size – Limits – Tolerance – Allowances - System of Limits - Fit and Tolerances Types of Fit - Hole Basis and Shaft Basis - Gauges and Template –Purpose – Types - Limit Gauges – Purpose – Types – Definition - Description and Use of Worker's Inspection and Master Gauge – Principle - Construction and Use of Sine Bar and Sine Center - Types and Description of Slip Gauges – Purpose - Construction and Method to Use Tool Makers - Microscope and Profile Projector - Defects and Remedies of Turning - Milling and Grinding - Defects Such As: Taper - Chattering - Poor Surface Finish – Parallelism - Surface Finish Primary and Secondary - Surface Roughness Related BIS Symbols.

Unit VII: CNC Fundamentals (20 Questions)

CNC Work Station - Introduction to CNC Machine - Input Devices - Output Devices – CPU – Memory - Communication between CNC and Computer – Types – Construction - Different Elements of CNC Machine - Comparison between Conventional Machines and CNC Machines - Advantages and Disadvantages of CNC Machines - Axis Designation - Co-ordinate System and their Applications - Different Types/Functions of G Codes and M Codes Used in CNC Part Programming - Different Types of Interpolation and Its Applications - Cutter Radius Comp - Tool Wear Comp - Tool Nose Radius Comp - Tool Nomenclature - Tool Change Command - Work and Tool Offset - Part Programming for Both Turning and Milling Using Geometrical Information and Technological Information (G & M Codes) Such As Feed – Speed - Depth of Cut.

Unit VIII: CNC Turning Centre (20 Questions)

Modes of Operation Such as JOG, MPG, REF, MDI/MDA - Program Execution in Different Modes Like Auto SBL and Auto Cont. Mode - Knowledge on CNC Cutting Tools - Geometry – Material - Cutting Speed – Feed and Depth of Cut. Techniques of Tool Off-Setting and Tool Setting - Prepare Various Programs as Per Drawing - Concept of Contour Programming for Different Profiles - Program for Different Cycles Such as Stock Removal – Grooving – Threading - Undercut and Canned/ Fixed Cycles Tool Type Chart – Tool Nose Radius Compensation (TNRC) (G41 And G42).

Unit IX: CNC Vertical Machining Centre (25 Questions)

Modes of Operation Such as JOG, MPG, REF, MDI/MDA - Program Execution in Different Modes Like Auto SBL and Auto Cont. Mode - Knowledge on CNC Cutting Tools Geometry – Material - Cutting Speed – Feed And Depth Of Cut - Techniques of Tool Off-Setting and Tool Setting - Programming for Different Operation Such as Face Milling - Edge Milling - Slot Milling (Radial and Circumferential) - Tool Type Chart

- Application and Effect of Cutter Radius Compensation (G41 And G42) - Programming for Pocket Milling (Square and Circular) and Canned / Fixed Cycles for Hole Machining - Importance of Technical English Terms Used in Industry – (In Simple Definition Only)Technical Forms - Process Charts - Activity Logs - In Required Formats of Industry – Estimation - Cycle Time - Productivity Reports - Job Cards - Concept of Contour Programming for Different Profiles.

Unit X: Preventive Maintenance, Predictive Maintenance and Concepts of Total Productive Maintenance (TPM) (15 Questions)

Difference between Breakdown and Preventive Maintenance –Routine Maintenance – Periodic Checking for Lubrication – Hydraulic Oil Level – Hydraulic System Pressure – Check Pressure Adjustment - Its Importance in Productivity – Types - Normal Procedure followed for Maintenance of Machine Tool in the Shop Floor - Importance of Centralized Lubrication System - Hydraulics and Pneumatics – Cleaning and Adjusting the Pneumatic Filter – Pressure Regulator and Lubricator.

34. Trade – Pump Operator cum Mechanic

(ITI Standard)

Code: 545

Unit I: Safety and Fire (5 Questions)

General rule pertaining to the Institute - Safety Precautions to be observed in the shop. Basic first aid and safety signs. Personal Productive Equipment (PPE) Fire and fire Extinguisher - Description, types and uses. Energy conservation – Minor ECOs and Medium ECOs, Major ECOs Definition and uses. Safety disposal of used engine oil.

Unit II: Basic Tools and Measuring Instruments (40 Questions)

Marking tools: Marking material and marking tools - Definition and uses. Surface plates, try square. surface gauges, scriper, punches - definition types and uses.

Hand Tools: Hammer, Screw drivers, C-clamps, Spanners, Pliers - Side cutters, Snips, Circlip Pliers and Wrenches – Fuller gear definition types and uses.

Power Tools: Air impact wrench, air ratchet, car jet washer Pipe flaring tool, pullers - Gear Definition types and uses.

Measuring instruments:

Calipers, dividers, Steel rule, Micrometers – Measuring of cam height, Camshaft Journal dia., crackshaft journal dia., valve stem dia., piston diameter and piston pin dia. With outside Micrometers – Measuring of the height of the rotor of an oil pump - Vernier calipers, Telescope gauges, Dial bore gauges, Dial indicators – Measuring on cylinder bore, connecting rod bore, inside diameter (ID) of a camshaft bearing with Telescope gauges - straight edge – Measuring the flatness of the cylinder head is warped or twisted with straightedge is used with a feeler gauge - feeler gauge, thread pitch gauge, vacuum gauge – To check engine manifold vacuum with vacuum gauge - Definition, types, uses and care.

Cutting tools:

Chisels – Description and use – Types – File- Definition, parts of a file, specification, Grade, Shape, different type of cut and uses - hacksaw, Drilling machine – Drilling clear and blind holes, sharpening of twist drills – Safety precautions to be observed while using a drilling machine - Drill holding devices, work holding devices - grinding machine, drills and reamers - Definition types , uses and care – Different type of hand reamers, drill size for reaming - Adjustment of two-piece Die, reaming a hole/Bush to suit the given pin - Taps and Dies – Screw extractors – Description - Tapping a clear and blind hold, Selection of tape drill size – use of lubrication, use of stud extractor - Definition, types, uses and care. Lapping, Lapping abrasives, type of Laps – Flow lamp – Pipe bending, fitting nipples unions in pies – Soldering a brazing of pipes – Description and uses in pipe fitting

Unit III: Fasteners (10 Questions)

Screws, nuts, studs & bolts, locking devices, such as lock nuts, cotter, split pins, keys, lock rings, lock washers. Washers - Definition, types, uses and care. Gaskets, packing and oil seals - Definition, types, uses and care.

Unit IV: Basic Electrical and Electronics (15 Questions)

Electricity principles, Ground connections, Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter Multi meter, Conductors & insulators – Measuring of current voltage and resistance using digital multimeter – practice continuity test for fuses, jumper wires, fusible links, circuit breakers – Series, Parallel, series-parallel circuits using ohm's law -Joining of wires using soldering iron – Construction of simple electrical circuits - Wires Fuses & circuit breakers, cable colour codes , resistors, Capacitors Semiconductors,diodes,and logic gates - Definition types , and applications - Relays, Solenoids, Primary & Secondary winding, Transformers, stator and rotor coils.

Batteries & cells, Lead acid batteries & sealed Maintenance Free (SMF) batteries – Cleaning and topping up of a lead acid battery, Testing battery with hydrometer – Connecting battery to a charger for battery charging – Testing of relay and solenoids and its circuit.

Unit V: Welding, Non-Destructive Testing Method and Hydraulics (10 Questions)

Arc welding and oxy – Acetylene welding - description, classification and applications – Manual Metal Arc welding – Principles, power sources, electrodes, welding – Straight beads and Butt, Lap and T joints manual metal arc welding – Setting of Gas welding flames - Heat Treatment Process description, classification and applications – Heat treatment process – Introduction, definition of heat treatment – Definition of Annealing, Normalizing, Hardening and tempering – Case hardening, Nitriding, induction hardening and flame hardening Liquid penetrant and Magnetic particle testing method – (Portable Yoke method) description and applications – Definition of Pascal law, pressure, force, viscosity. Description, symbols and application of Gear pump-internal and external, description and function of air reciprocating compressor. Function of air service unit (FRL - Filter, Regulator and Lubricator) – Tracing of hydraulic circuit on identity and pneumatic component and assembles in the workshop

Unit VI: C.I and S.I Engines & Its Trouble Shooting (15 Questions)

Pump Industry in India – Leading manufacturers, development in pump industry, trends, new product – Different type of stationary engine and their applications – Diesel tolls and equipment required for maintenance, engine parts and their handling technique - Principle of Compression-ignition engine, differentiate between 4 stroke and 2 strokes - differentiate between C.I engine and S.I Engine. Different type of starting and stopping method of Diesel Engine - Technical terms used in engine, Engine specification – To clean fuel tank & check leak in the fuel line – Lubrication system – Types, description and advantages of each over others – Filters and oil coolers – Their description functions and method to overhaul for efficient functioning – Cutting, flaring of tubes to make T & Elbow fitting using unions - Filters, fuel tank and oil coolers – their description functions and method to overhaul for efficient functioning

Trouble Shooting:

Causes and remedy - Engine Not starting, Mechanical & Electrical causes - High fuel consumption, Engine overheating - Low power Generation - Excessive oil consumption – Low / high Engine oil Pressure, Engine Noise - Troubles and remedy in charging and starting system.

Unit VII: Power Transmission (5 Questions)

Belts, bushes, bearing and couplings -Description, types and application. Procedure to fit bushes, bearings and coupling safely

Unit VIII: Pumps (70 Questions)

Pumps and Prime Mover: Description, classification, uses and developments – Plain / Journal bearings, anti-friction bearings used on machine assemble – specification and selection for appropriate use – use of manufacturers catalogues – mounting of bearing on shafts and in housing with proper fit and axis alignment – use of proper tools – removal of bearing from shafts and housing by using pullers – cleaning up and removing

old metal form bearing and replacing with new metal – checking of shafts for alignment with dial indicator.

Reciprocating pump: Description, Classification, construction and operation & installaion technique – Dismantling of reciprocating pumps-vales, pistons, cranks, seals etc. for inspection, repair and replacement – Pumps – Its for agricultural and industrial applications – Classification of pumps, its prime movers, parts and operation safety – Classification of reciprocating pump, construction and operation – Installation technique of reciprocating pump – Tools and equipment require and procedure.

Rotary pump: Description, Classification, construction and operation & installation technique –Classification of rotary pumps – construction and operation – repairing procedure – Brief description of turbine and stage pumps, positive displacements and their advantages - meaning of priming and its effect – installation techniques of rotary pump- procedure, tools and equipment required – cleaning of parts and assembling – checking for alignment, clearance, etc., priming technique and its application

Valves and Seals: Description, Classification, construction and operation & application – Different types of valves – their description, advantages and use – special pumps and glands used for corrosive fluids - different gasket cement used to prevent leakage and advantages of each over the other – principle of direct reading pressure and temperature measuring instruments – Selection of gasket, packing and gland materials, marking and cutting off gasket as per shape and profile – Installation of seals leather polythene, asbestos, rope rubber and mechanical seals - Method of install align and testing of pumps for their serviceability. Concept of lightening torque for different sizes of bolts.

Centrifugal pump: Description, Classification, construction and operation & instalation technique – Principle of centrifugal pump – construction and operation of centrifugal pump in series and parallel – finding out defects and method to recondition centrifugal pump.

Submersible pump: Description, Classification, construction and operation & installation technique - submersible pump – construction, operation and selection of appropriate type – procedure to recondition, install and test of submersible pumps – causes of failures and remedial measures – dismantling, identifying of parts – finding out defects, repairing and replacement of components – cleaning, assembling, installing and testing of submersible pumps – finding out and rectifying faults developed during operation - Description, types and applications of gasket cement

Pipes and pipe fittings: Description and uses – Thread cutting. Various tools and accessories used in pipe fitting with their details - Procedure to be followed for preventive & scheduled maintenance and trouble shooting in pump sets

Unit IX: Identify and Check Functionality of Major Components and Assemblies of A.C. Motors (10 Questions)

AC Motors: related terminology. Purpose, type, construction, operation, testing for correct functioning, maintenance and industrial applications – Trouble shooting and protection of induction motor.

Unit X: Lifting Equipment, Key, Rope and Knots (20 Questions)

Key: Types of key and keyways, their uses and applications. Preparation of keys, allowable tolerance, clearances – Key fitting procedure-methods. Procedure for removing keys – Types and uses of key pullers – Making out key as per shaft, hub, keyways, preparing keys to fit into keyways

Rope and knots: Description, Classification, and application – Specification and use of different types of ropes such as hemp, manila, nylon, wire etc. Practicing different types of knots and its applications – Method of joining two ropes together for extension – Specification and correct use of slings – Safety to be observed in use of ropes and slings.

Lifting Equipment: Different types of lifting tackles for components of pump set –Screw jacks, chain pulley block, crabs and winches, rollers and bars, levers, lashing and packing - use of inclined plane, hydraulic trolleys - Precaution to be observed while using lifting tackles.

Pulleys: Description, Classification, and application – making different types of keys for fitting pulleys – assembling and dismantling of bushes, bearing and couplings – Types of pulleys solid, split, “V” groove, step, cone, taper, guided and jockey or rider pulleys, their functions and uses – procedure to assemble and dismantle pulleys and impellers from shafts following safety precautions.

35. Trade – Mechanic Refrigeration and Air Conditioner Technician

(ITI Standard)

Code: 435

UnitI: Basic Safety and Refrigeration System (20 Questions)

General Safety precautions and first aids, Fire fighting Equipment and Electrical Safety - Different types of Fitting Hand Tools – Their use - Electrical Terms such as AC and DC supply, Voltage, Current, Resistance, Power, Energy, Frequency, Safety Precautions to be observed while working on Electricity, Conductors, Insulator Materials – Measuring Instruments such as Voltmeter, Ammeter, Ohm Meter, Watt Meter, Energy Meter and Frequency Meter – Earthling and its importance, Basic Principle of Semi-Conductors, Application of Diodes – Transistors – IC's, Soldering, Brazing, Oxy-Acetylene Welding, Basic Principles of Welding Processes commonly used, Basic Principles of Refrigeration, Working, use specification, Refrigeration Tools, Instruments and Equipment – Fundamentals Refrigeration and it's units – Thermodynamic Laws.

Science Related to Refrigeration, work, power, energy, force, heat and Temperature, Different Temperature Scales, Thermometers, Units of Heat, Sensible Heat Latent Heat, Super Heating and Sub-Cooling, Saturation Temperature, Pressure Types, Units –Type of Refrigeration System – Study the Construction and working of Vapour Compression Cycle – Low side & High Side of Vapour Compression System, COP (Coefficient of Performance), Ton of Refrigeration.

Unit II: Refrigerators and Its Types (20 Questions)

Refrigerator (Direct coot of frost free), Function, Construction working of Single Door Direct Cool Refrigerator, Frost Free Refrigerator, Specifications, Trouble Shooting, Heat Insulation Materials, Care and Maintenance of Refrigerators, Mechanical and Electrical Components of Refrigerator's.

Importance of Flushing in Evaporator, and condenser, Use of Dry Nitrogen for Flushing – Evacuation, Leak Testing, Gas Charging Method in Refrigerator.

Frost Free Refrigerator Two or Three Door Parts – Function – Electrical Accessories and its Function (Timer, Heater, Bimetal, Relay, OLP), Refrigerator Cabinet Volume Calculation).

Refrigerator Inverter Technology – Two and Three Door Construction –Working – Care and Maintenance.

Unit III: Compressor, Motor and Refrigerants (20 Questions)

Types of Compressors used in Refrigeration and Air-Conditioning, Function, Construction – Wet Compression – Oil Properties – Lubrication Methods – Applications.

AC Motors – Types – Advantages of AC Motor Over DC Motor – Starting and Running Winding – Starting Current, RSIR, CSIR, CSR and PSC Motor, Functions of Starting Relay, Capacitors, OLP.

Classification of Refrigerants – Properties of Refrigerants – Pressure and Temperature of Different Refrigerants – GWP, ODP of various Refrigerants – Properties of Insulating Materials used in Refrigeration and Air-Conditioning.

Unit IV: Condenser, Expansion Valve and Evaporator (20 Questions)

Function of Condenser, Type, Liquid Receiver, Pump Down, Drier Function, Types – Expansion Value used in Domestic Refrigeration and Air-Conditioning – Capillaries, Automatic and Thermostatic Expansion Value and Electronic Expansion Value, Evaporator – types, construction, working and its uses.

Unit V: Air-Conditioner and Its Types (30 Questions)

Window Air-Conditioner, Split Air-Conditioner, Construction, Multi split AC, Inverter Split AC Working, Mechanical, Electrical Components – Types of Split Air-Conditioners – Study of Wiring Circuits – Installation and Servicing – Fault Finding – Testing Components.

Unit VI: Commercial Compressor and Its Types (10 Questions)

Commercial Compressor: Function, types Construction & Working Applications. Compressor Lubricant Oil, Properties types of Lubricant Methods.

Unit VII: Water Cooled Condenser, Cooling Tower, Evaporator/Chiller and Water Treatment (30 Questions)

Water Cooled Condenser: Types and Capacity, Construction, Working and De-Scaling Application, Evaporative Condenser – Function, Construction and Application.

Cooling Tower: Types, Construction, Capacity, Efficiency, Approach and Cooling Tower Range.

Water Treatment: Causes for Water Contamination and Water Treatment.

Evaporator and Chillers: Construction Function and Types of DX Chiller, Types of Defrost System, Water / Brine Chiller, Types of Brine used as secondary Refrigerant.

Unit VIII: Heat Exchanger, Accumulator, Water Cooler and Deep Freezer (10 Questions)

Heat Exchanger and Accumulator: Function and Construction, Applications, Oil Separator – Function and Construction.

Water Cooler: Types, Construction and Working Principle and its Applications.

Deep Freezer: Description, Construction, Working Specifications, Care and Maintenance, Fault and Remedies.

Unit IX: Ice Candy Plant, Ice Plant and Cold Storage/Walk In Cooler (20 Questions)

Ice Candy Plant: Function, Construction Working Principle, Capacity, Types of Compressor used.

Ice Plant: Details about Components of Ice Plant their Functioning.

Cold Storage/Walk in Cooler: Details about Components, their Functioning, Working Principle, Circuit Diagram, Capacity and types, Care and Maintenance, Food Preservation Spoiling agents, Preservation by Refrigeration System, Types of Cold Storage and its Details.

Unit X: Direct and Indirect Air Conditioning System, Duct, Air Filter and Control System of AC Plant (20 Questions)

DUCT and Air Filters: Function, Types, Materials, and Designing DUCT, Function of Air Filter Types, Construction, Maintenance, Effect of Chocked Air Filter.

Direct Central Air Conditioning Plant: Construction and Working Principle, Types, Maintenance of Direct Airconditioning plant.

Humidification and Dehumidification method Description of AHU and FCU.

Temperature and Pressure control used in AC Plant, its Construction, Working, Safety Device and Pipe Line.

Indirect/Chiller System: Construction and Working Principles, Maintenance of Indirect/Chiller System, Air-Washers used in chilled water system.

Control System of AC Plant: Controls used in AC System, Electromechanical, Pneumatic and Electronic, Details study of Heat Load Calculation for Commercial and Industrial Buildings.

36. Trade - Sewing Technology

(ITI Standard)

Code: 546

Unit I: Safety Precautions & First Aid, Tools & Fabric Fundamentals (15 Questions)

Safety Precaution: First Aid- Pwd – Gender - Sanitization

Tools: Trade related Tools, Their Importance and Safety, Measuring Tools - Drafting Tools - Marking Tools - Cutting Tools - Sewing Tools - Finishing Tools

Fabric Fundamentals: Brief idea about Fibers - Types of Fabrics - Selection of Needle and Thread According to Fabric Types - Weaves Type - Needle Guard Policy - Fabric Preparation for Cutting - Fabric Grain - Characteristics of Fiber - Selvedge- Shrinkage - Straightening of Fabric Grains - Measurements - Units - Measuring Techniques – Marketing – Collecting Marketing – Information – Implementing Marketing - Collect Needed Information - Implementing Marketing Research Plan - Basic Garment Analysis.

Unit II: Sewing Machine & Overlock Machine (20 Questions)

Sewing Machine: Types - Parts and functions - Machine Needle - Stitch Formation - Care and Maintenance - Troubleshooting - Types of Industrial Sewing Machine - Parts - Function,

Overlock Machine: Parts and Functions - Types - Care and Maintenance – Troubleshooting.

Unit III: Seams, Fullness, Hand stitches and Decorative Stitches (20 Questions)

Seams: Classification - Uses - Properties of Seams - Seam Finishes - Sewing Aids - Special Attachments - Presser Foots - Folders - Guides - Gauges

Fullness: Darts - Necessity - Type - Precautions during Stitching

Pleats: Types and uses necessity

Gathering and Shirring – Ruffles/Flares - Frills

Tucks: Types and uses

Hand Stitches: Hand Needles - Size and Types, Application of Hand Stitches Types - Decorative Stitches - Usage.

Unit IV: Hems, Corner making, Casing and Edge Finishing (20 Questions)

Hems: Types & Uses

Corner Makings: Types & Uses

Casing: Types and Uses

Edge Finishing: Facing - Types and Uses - Binding - Piping - Banding

Unit V: Neckline, Placket, Pockets, Collars and Sleeves (20 Questions)

Neckline: Different Shapes of Neckline

Placket: Types and Sample Makings

Pocket: Types and Design Variations

Collars: Classification and Collar Terms

Sleeves: Classification - Sleeve Length Variation - Making of Sleeve with Cuff, Types and Without Placket.

Unit VI: Trimmings, Buttonhole, and Mending (15 Questions)

Trimmings: Types - Applications - Fixing of Buttons, Hooks, etc.

Buttonhole: Buttonhole and Types

Mending: Darning, Patching and Types

Unit VII: Human Figures, Patterns, Pressing, and Mass Production (30 Question)

Human Figures: Eight Head Theory - Brief about Joints and Muscles - Types of Figures - Body Measurements - Importance - Types & Measuring Techniques - Precautions - Measurement Charts - Record and alterations as per Requirement of Customer.

Patterns: Importance - Pattern Information - Types of Spreading - Pattern Layout - Pattern Drafting - importants Spreading methods/Machines. Types of Pattern Layout - Pattern Terminology - Pattern Drafting - Tools for Pattern Making.

Pressing: Tools - Methods - Importance of Pressing - Trial Room - Necessity - Specification - Techniques of Pressing

Mass Production: Sequence of operations - Types of Cutting Machines - Fusing Technology - Types of Industrial Machines. Used Sewing Section - Finishing.

Unit VIII: Drafting the Pattern for Ladies Suits / Wear (20 Question)

Drafting the Pattern for Ladies Suit: Kameez - Salwar - Features of Salwar - Churidar - Features of Churidar.

Ladies Wear: Ladies Top - Short Kurties - Ladies Suit - Princess Line Kameez - Types of Anarkalli - Nightwear - Types (One Piece, Two Piece, etc.,) - Types of Cloth - Collar - Saree Blouse - Types - Saree Petticoat.

Unit IX: Kids Wear and Gents Wear (20 Question)

Kids Wear: Dresses For Newborn - Zabala - Types - Dresses For Toddler - Baby Chemise - Types of Slips - Baby Set - Kids Wear - Umbrella Frock - Baby Set - Combination Suit - Types of Cloth - T-Shirt - Trouser - Skirts and Shorts.

Gents Wear: Kurtha Types - Pyjama's Types - Shirt Types - Cloth Grain - Neck Types - Sizes - Gents Trousers Types.

Unit X: Laundry Stains and Techniques of Quality Control (20 Question)

Laundry Stains: Classification and Removing techniques. International Label System - new Development fabric performance code, different kinds of stain - cleaning agents.

Quality Control: Techniques of Quality Control - Need & Planning, Types of Inspection - Stages of Inspection - Role of Quality Controller.

37. Trade- Sheet Metal

(ITI Standard)

Code: 520

Unit I: General Safety Precautions and First Aid (10 Questions)

Elementary of First aid – Importance of the sheet metal work in the industry – General Safety Precautions – Safety precaution in sheet metal work.

Unit II: Metals and Non-Metals and Their Characteristics (20 Questions)

Metals and non-Metals and their Characteristics – Types, Sizes and uses of sheet metals as per BIS – Raw material information – CRCA, HRCA & MS Material – Terms & Definitions in sheet metal work – Properties and uses of tin – Stainless Steel – Lead – Zinc – Silver – Muntz Metal, Gun Metal – White Metal – Physical Properties.

Unit III: Marking and Laying Out Tools and Accessories (20 Questions)

Measuring Tools – Steel rule – Calipers – Try Square – L Square – Micrometer – Vernier Caliper – Vernier Height Gauge – Combination set – Screw Pitch Gauge – Radius Gauge –Standard Wire Gauge – Bevel Protractor.

Marking Tools – Scratch AWL – Divider – Trammel Point – Punches

Cutting Tools – Snips – Shears – Hacksaw – Chisel – Cutting Plier – Files – Drills – Tap & Die Sets – Use of die and die holder.

Hand Tools – Mallets – Hammer – Groovers – Riveting tools – Screw Drivers – Wrench and Spanners – tap wrench.

Holding tools and accessories – Vices – C Clamps – Stakes – Stakes holder – Hollow Mandrel – Wooden Former – Jigs & Fixtures.

Unit IV: Sheet Metal Folded Joints (15 Questions)

Description of Sheet Metal Seam – Grooved Seam – Locked Grooved Seam – Paned Down Seam – Knocked Up Seam inside and outside – Capstrip seam – Pitsburg seam.

Folding and joining allowances - Edge Stiffing, Wiring allowances and false Wiring – Types of notches in Sheet Metal.

Unit V: Development and Laying Out Pattern (20 Questions)

Definitions of Pattern – Development – Stretched out pattern – Master Pattern – Templates – Development of Parallel line method – Radial line method – Development of Surfaces – Triangulation Method – Geometrical construction methods.

Development and laying out pattern of elbow pipe – 'T' Pipe – Offset Pipe in equal diameter – Development of 'T' pipe, round equal and unequal – Introduction to tubes and pipes –Laying out pattern of 60^0 off-set 'T' pipe – Pattern development of 'Y' pipe – Development and laying out pattern of segmental quarter bend pipe.

Unit VI: Punches, Riverts and Fastening of Sheet Metal (20 Questions)

Solid and hollow punches – Description of hand punches as per BIS – Sizes of solid and hollow punches and their uses.

Rivets and its parts – selection of rivet heads – Types of rivet and their uses – standard sizes of rivets and riveting tools – Calculation of Riveting allowances (Pitch and Lap)

Fastening of sheet metal – Self taping Screws – Clips and connectors – Uses, types and allowances of 'S' Clips – Government Clips, Drive Clips – Mailing Clips.

Unit VII: Sheet Metal Soldering, Surface Preparation, Corrosion and Surface Protection (20 Questions)

Types of Soldering bits - Solder – different types of solder and their composition – Types and uses of Fluxes – their effect on different metal.

Process of soft soldering – Hard soldering (Brazing) – Heating appliances – Hand forge – Blow lamp.

Method of Galvanizing – Tinning – anodizing – Sheradising – Electroplating

Preparation of pickling solution – Protection coating and cleaning – Preparing of sheet metals corrosion and Anti corrosion treatment of sheet metal.

Unit VIII: Gas Welding, Arc Welding, Co2 Welding Tig Welding Process (30 Questions)

Safety Precautions in gas and arc welding – Description of Oxyacetylene Plant – Equipments – accessories – tools - Types of oxy –acetylene Flames – Uses – Types and description of Flux – Types of Welding blow pipes – Functions – Various types of pipe joints – Gas welding defects – Causes – Remedies

Types of weld joint – Weld positions Principle of arc welding – Types of welding machines and their uses – Advantages and Disadvantages of AC/DC Welding Machines – ARC Length and its Importance – Welding defects.

Principle of resistance Welding – types and application – Welding symbols – CO2 Welding process – Welding equipments – accessories – Advantages and application

TIG welding process – Advantages – equipments – Types of polarity and application – Types of tungsten electrodes – Filler rods Shielding Gases – TIG Welding Defect – Causes - Remedy

Latest Sheet metal cutting Techniques – Plasma cutting – Laser cutting – Water jet cutting.

Unit IX: Sheet Metal Ducting, Aluminium Fabrication, Painting, Radiators and Material Handling (25 Questions)

Need for ducting –Places where ducting is employed – Working principle of dust Cyclone – Gutter – Uses – False Ceiling.

Aluminium Fabrication – Application – use of Copper and alloys – Chemical and Physical properties of aluminium – Specification of aluminium Channels – angles – Strips – Tubes beadings – Packing rubber – Cardboard – Glasses – Tools and equipment used in aluminium fabrication – Automobile Assembly – Sub assembly – Guarding assembly – Door assembly – Chassis assembly – Power pack assembly.

Process of painting – Spray Painting – Etch Primer painting – Powder Coating – buffing – Grinding – Sanding – Selection of different grit sizes.

Types of radiatiors and construction of radiators - Mufflers - Estimation of Work – Material handling – handling of light, medium and heavy materials – uses of Cranes – Types –Estimation and Costing.

Unit X: Hand Punch Machine, Drilling Machine, Swaging and Beading Machine, Bending Machine, and Spinning Lathe (20 Questions)

Description of hand punch machine – Hand and power operated drilling Machines – Drill bits – Parts – effects of Cutting angles – angles for drilling sheet metals – effect of speed – feed cutting fluids on metals.

Swaging and beading machine – Parts – Operating Principles – Description of fly ball press – Power press – Press brakes – Method to calculate the pressure adjustment – Clearance between die and punch – ‘C’ and ‘H’ frame presses

Pipe / Tube bending – description of Hydraulic pipe bending machine – Operating principle – Roll forming machine – Types – Operating principle – Slip roll forming machine – function

Method to operate folding / brake folder for typical folding – Planishing and its application – Description of polishing Machine – Various types of bobs and polishing compounds

Operating principles of spinning lathe – Description of Spinning – types of Spinning lathe tools and their uses.

38. Trade - Smartphone Technician cum App Tester

(ITI Standard)

Code: 547

Unit I: Safety Precautions and Basic Electrical &Electronics (20 Questions)

Importance of Safety- Precaution to be taken in the industry / Shop floor - Safety Signs - PPE - First Aid - Importance of Housekeeping - Health - Safety and Environment guidelines -Legislations & Regulations - Fire Extinguisher –Current – Voltage – Basic Electricity - Electronic Components Conductors – Semi-Conductors – Insulators - Resistor - Capacitors - Transistors - Diodes - Rectifiers - Relay - Transformer & Multimeter - Soldering & Desoldering Techniques-Number System - Binary - Octal - Decimal - Hexadecimal - Digital IC- Transistor-Transistor Logic Complementary Metal Oxide Semiconductor(CMOS) - Logic gates - AND Gate - OR Gate - NOT Gate - NAND Gate - NOR Gate - EX-OR Gate - EX-NOR Gate.

Unit II: Sections of Mobile Phones, Mobile Network, Multimedia Handsets & Its Troubleshooting (35 Questions)

History and Features of Mobile Phones - Block diagram - Circuit diagram - Generations of Mobiles GSM - CDMA - WCDMA - 2G - 3G - 4G - 5G Network Protocols- Basics of Mobile Communication - Parts and Functions of Mobile Components-Working Principle of Speaker Antenna - External Antennas - Internal Antennas - Tx/Rx Switch - Battery - Connectors - Microphone - Speaker - Camera – Display - Assembling & Disassembling of Mobile Phones - Signal Frequency in Mobile Phones, GPS,EDGE & HSPA - SIM & IMEI- Lock /Unlock of Sim - Check mobile IMEI number - Technology & Working Principle of GPRS - Bluetooth and Infrared (IR)– Troubleshooting of Mobile Phone - USB - Ethernet port - Types Network & Data Cable -Concept of Mobile Network -LAN - MAN - WAN - Battery System- Type of Cells / Batteries used in mobile phones - PCB Concepts Concept of Display and Keypad Change Procedure.

Unit III: Repairing Tools for Smart phones (20 Questions)

Tools -PCB Holder - Soldering Iron - Magnifying Glass with light - Solder wire - Multimeter- ESD mat - Screwdriver Kit - Opener - Tweezer - ESD Cleaning Brush - Jumper wire - Solder Paste - Paste Flux - Liquid Flux - PCB Cleaner - Blade Cutter - Nose Plier - Point Cutter- Desoldering Wire ESD Safe Hand Gloves - Antistatic Wrist Strap - Antistatic Apron -Equipment - Soldering Station - SMD Rework Station (Hot Air Blower) - DC Power Supply - Battery Booster & Tester - Test JIG Box - BGA Kit - LCD Tester - IR Workstation - Ultrasonic Cleaner- Smoke Absorber.

Unit IV: Smart Phone Architecture – OS - Card reader & OTG - IC - Apps - Recovery Concept in Smart Phones (20 Questions)

Difference Between Basic and Smart Phone - Smart Phone Architecture - Operating System used in Smart phones - Basic Features of Android and Windows Phones - Wi-Fi Concept & File Download and Sharing Techniques via Blue tooth - Hotspot - Data cable & Card reader - Concept of OTG - NFC - Integrated Circuit (IC) Based on Technology - Types of Apps in Smart Phones - Smart Phone Recovery Procedure for Android.

Unit V: Repairing of Mobile Phone Components (20 Questions)

Testing of Various Parts in Mobile Phones -Using blower -DC power supply - charging booster machine - Infrared Work Station - SMD Rework Station - Ultrasonic Cleaner - Soldering Iron(10 & 25 watts) - De-Soldering wire or wick - Troubleshoot Hanging Issues, Camera Problems, USB Charging - Power Failure - Replacement of Touch Sensor and Fingerprint Sensor - Ball Grid Array (BGA) Technology - IC Reballing and Installation - Radiation Levels & Compliance Standards for Mobile Phones in India.

Unit VI: Software in Smart Phones (15 Questions)

Third Party Software - Removing Virus - Locking & Unlocking Technology - Firmware and Step to Install a New Firmware-Encryption & Decryption of password in mobile phones-Flashing - Requirements for Flashing - Different types of Flash tools - Software used for security - Locking & Blocking adds - Flash Android phone using Odin - UFI - MTK - SPD - Qualcomm etc.

Unit VII: Troubleshooting in Smart Phone - Circuit Tracing and Heatsink (10 Questions)

Software Update - Data Backup - Defragmentation of Hard Drive - Wi-Fi Protection-Circuit Diagram Reading & Tracing - Check PCB tracks using Multimeter - Jumpering Techniques - Usage of PCB holder - Find fault in track - Phone Upgradation - Concept of Heatsink and Working principle.

Unit VIII: Tablet and its Components and Trouble Shooting (20 Questions)

Assembling & Disassembling of Tablet - Touchscreen - Liquid Crystal Display (LCD) - Rear Panel Battery - Connectors - Microphone -Integrated Circuit(IC) Power IC - Central Process Unit (CPU) Read only Memory (ROM) - Random Access Memory (RAM)-Flash IC - Charging IC - Logic IC - Audio IC - Radio Frequency (RF) IC - Voltage Controlled Oscillator (VCO)- Antenna Switch - Power Amplifier (PA) - Troubleshooting of Mic - Speaker - Bluetooth - Wi-Fi section - Touch screen Section- Charge Connector - Memory card Connector.

Unit IX: Perform App Testing in Smart Phone (30 Questions)

Vulnerability Scanning - Penetration Scanning - Security Scanning - Localisation Testing - Functional Testing -Unit Testing - Acceptance Testing - Recovery Testing - Regression Testing - Reliability Testing - Storage Testing - Compatibility Testing - Application Testing -Application Response Testing - Memory Leakage testing - Interrupt testing - Usability testing - Certification testing - Upgrading existing software - Load testing - Uninstallation testing - Backup and restore testing - Power Consumption testing -Installation testing - Execution testing - Cross Operating System testing- Cross Device testing - Cross Versions testing- Source of Apps - Play Store - App Store - Types of Mobile Apps - Native App - Government Promotional Apps- BHIM - IRCTC.

Unit X: Basic Security Features and Settings (10 Questions)

Graphical User Interface (GUI) - Navigation -Secure Digital (SD Card) & Its Features - Security Testing for Mobile Apps- Mobile Testing Tools - Appium - Espresso - Test Complete - Robot Framework - Xamarin - UI Test - XCUI Test - Mobile User Interface (UI).

39. Trade - Solar Technician (Electrical)

(ITI Standard)

Code: 548

Unit I: Safety, Electricity and Magnetism (15 Questions)

Safety Rules and safety signs – Types and working of Fire Extinguishers – First aid safety practice – Hazard identification and prevention – Response to emergencies – Power failure, system failure and fire.

Types of Wires and Joints - Soldering Methods - advantages of BIS/ISI. Trade tools specifications.

Electrical symbols - National Electrical Code.

Fundamentals of electricity - current - voltage- power - resistors- Capacitor - Generation of DC electricity - Electrical conductors - insulators.

Differentiate between AC and DC current - Ohm's Law - Simple electrical circuits problems - Kirchoff's Laws and applications - Open and short circuits in series and parallel networks - Series and parallel combinations of resistors.

Magnetic terms - magnetic materials - properties of magnet.

Electrostatics – Capacitor – types – function – uses - Inductive and capacitive reactance and their effect on AC circuit - AC DC comparison- Advantages of DC and AC systems - Sine wave - phase - phase difference - frequency - Instantaneous value - R.M.S value - Average value - Peak factor - form factor - power factor and Impedance. Active and Reactive power - Single Phase and three - phase system- Advantages of AC poly - phase system – three-phase Star and Delta connection - Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load.

Unit II: Electrical Wiring (15 Questions)

I.E. rules on electrical wiring.

Types of domestic and industrial wiring - wiring accessories – switches – fuses – relays – MCB – ELCB – MCCB - Switch gears.

Grading of cables and current ratings - lay out of Domestic wiring - Voltage drop - PVC conduit wiring – Casing - capping wiring - Different types of wiring - Power wiring - control wiring - Communication wiring - entertainment wiring - Wiring circuits planning - permissible load in sub - circuit and main circuit - Importance of Earthing - Plate earthing - pipe earthing - methods and IEE regulations - Earth resistance - Earth leakage circuit breaker - Lightening arrestor.

Unit III: Measuring Instruments, Electrical Energy, Transmission and Distribution (20 Questions)

Classification of electrical instruments - essential forces required in indicating Instruments – PMMC - Moving iron instruments - Range extension of meters – Wattmeter - PF meter - Energy meter – Megger - Earth tester - Frequency meter - Phase sequence meter – Multimeter - Tong tester - Instrument transformers – CT and PT.

Calculation of total watt hour of all loads per day - daily average watt hour from twelve months electricity bill.

Working principle of transformer - Electric power demand - supply and gap in city - state and national level - Conventional energy Generation by thermal (coal, gas diesel) and hydel power plant (small and large) - Advantages of high voltage transmission- Transmission network of India - distribution of power and substation- Overhead v/s underground distribution system.

Unit IV: Renewable Energy- Sunlight Parameters (20 Questions)

Non-renewable and renewable energy concepts - Advantages over non-renewable energy - renewable energy resources - solar (PV and thermal) – wind - Bio fuel – Biomass - small hydro power - Tidal power, Wave power - Geothermal energy.

Solar energy fundamentals - Sun path (east to west, North to south and south to north movement) - daily and seasonal changes of sunlight - Angle of inclination of radiant light and its relation with latitude and longitude of different locations on Earth - Key earth - sun angles - Equation of time - solar constant- GHI & DNI tracking (single axis and double axis) - Solar radiation over India (measurements, satellite data and maps) - (10-12 years historical data) - Application of sun chart on shadow identification - Sunlight spectrum

Unit V: Semiconductors, PV Array, Battery and Charge Controller (35 Questions)

Semiconductor properties and types - P-type and N-type semiconductors - PN junction conversion solar radiation to electricity - materials used to develop solar cells (Silicon, Cadmium tellurides) - Light sensitive properties of PN junction - Difference of photo electric and photovoltaic effects of a PN junction - PV cell characteristics - I–V curve - effects of temperature - Photovoltaic effect - Photo voltaic module - minimal

functional specification - cells per module - max watts per module - maximum voltage at max power - maximum current at max power - Standard test conditions (STC) of a PV module - Terminal box and connectors of a Solar PV module - Identification of various test standards of PV module - Measurement of area of the cells and compare with the module area in data sheet - Identification of faulty PV module - Measurement of area of the cells and compare with the module area in data sheet.

Solar PV array - series and parallel calculation - Handling of PV modules - Module mounting structures requirement - Photovoltaic cell and PV modules - types - mono crystalline – polycrystalline - amorphous silicon - thin film PV cells and their comparison - recent thin film technologies (CdTe, GIGS, CIS etc.) - Safe handling of panels.

Battery - Storage batteries - types of Batteries - Lead acid battery - nickel cadmium battery - lithium ion battery - Battery construction- working - charge/discharge and applications - Safe working with battery - Solar Rechargeable SMF Battery - energy, storage capacity specifications - voltage, ampere hour(Ah), state of charge (SOC), depth of discharge (DOD), Efficiency, C-rating, cycle life, self-discharge - Deep discharge and shallow cycle.

Block diagram of a charge controller - Tools required for working with battery - Charge controllers – fuses - blocking diodes - bypass diode - LED indicators - low voltage disconnect - high voltage disconnect - Solar DC home lighting - Solar mobile Handset charger - Solar FM radio - Solar DC fan and other solar DC devices - Power packs for decentralized energy supply - Troubleshooting of batteries and charge controllers.

Unit VI: Solar DC Applications, Testing, Maintenance and Disposal of Batteries (15 Questions)

Solar DC domestic application - Making of solar lantern - Solar Day lighting - Solar Garden Lights - Safety in DC system - Quality standards - Inventory list of equipments and tools for construction of a DC system - Solar DC industrial application - Solar streetlight - Solar home lighting system - Solar Security system - Solar DC water pump- Differentiate AC and DC solar pumps and their PV requirements for various HP capacity.

Battery bank - Series and parallel connections - Specific gravity - Use of hydrometer - Safety aspects in handling batteries - Charging/Discharging of batteries - Maintenance of battery - Risk of batteries - Ventilation requirements - Requirement of connecting only similar batteries - Disposal procedure of batteries - Common defects in batteries - Procedure for capacity testing.

Unit VII: Types of Charge Controller, Inverter and PCU (20 Questions)

Solar panel terminal wires and MC-4 connectors - Choice of wires (DC cables) used in the solar PV Electrical system - Array junction box (AJB) or combiner box - Protection devices in AJB - PWM charge controller - MPPT charge controller - Block diagram of charge controller. Overview of Sequence of connection (stepwise) in an off grid system.

Inverter – working - front panel controls - back panel controls - Normal and solar inverter - Solar charge controller for a normal inverter - Selection of solar inverter or Power Conditioning Unit(PCU) - Switching ON and shut down procedure of a solar inverter - Types of Inverter – Standalone - Grid Tied (MPPT/Central/String) - Micro inverter - IEC Std followed for Inverter in solar projects - Block diagram of Solar Photo voltaic electrical system - Classification of inverters Stand alone or off-grid inverter - Hybrid inverter - Grid-tie inverter - Wall mount or array mount inverter - Inverter room planning for Integration of inverters in large PV projects - PV System Software.

Unit VIII: Designing of Solar PV Project and Testing (40 Questions)

Single Line Diagram (SLD) - identifying different component symbols in SLD - System sizing - Selection of components of the Solar Photovoltaic Electrical system

Load calculation and system sizing - Battery sizing - Solar panel sizing - Sizing small and medium solar PV projects and their SLDs - Solar PV System types based on - Backup requirements - Grid availability -

Budget and space - Various skill requirements during solar PV plant installation - Guidance for Solar Installation by MNRE.

Performance standards IEC 62125/61646 (Diagnostic, Electrical, Performance, Thermal, Irradiance, Environmental, Mechanical) and Safety Standards IEC61730- 1,2 (Electrical Hazards, Mechanical Hazards, Thermal Hazards, Fire Hazards) - Hot spot on modules and method to detect them at site.

Site survey - Inspection of field and Selection of site - Shadow analysis - Types of roofs - Weather monitoring - Solar pathfinder and sun path diagram - Wind Load conditions on Solar PV Panels like Wind Speed - Height of Panel above roof and Relative Location of Panels on room

Identifying challenges in the placement of modules/PCU in the site - (Portrait/landscape placement) according to roof area and shadow free area – structure – type & age of the building - usable area - O&M challenges and integration issues Wire (cable) requirement / estimation - Special tools and material handling equipment required during installation - Solar panel mounting structures - Solar plant foundation planning - Installation of solar panels - Solar panel facing direction - Changing the angle of inclination as per location and seasonal setting – module mounting structure (MMS) systems or using trackers - Solar plant civil works – drilling - Digging – Finishing - Mixing concrete.

Battery Bank wiring - load wiring and distribution panel - Switching loads - economical planning of load distribution - Inverter wiring - Interface with the existing electrical system.

Commissioning skills - Preparation of check off list - Safety precautions before initial starting - Observation of parameters pre and post operation - Operational test before connecting to Load - Progressive load connecting and on load testing - Overload testing.

First inspection report generation - Customer orientation - Documentation and record - Do’s and Don’ts in the installation.

Types of installation for solar array mounts based roof types - Manual mount - Raft/rack mounts - Pillar or Pole mount - Building integrated mount - Ballast roof mounts - RCC roof top mount - Tracking mounts: Manual track Automatic track Single axis and dual axis - Safety at heights Condition monitoring and report generation.

Maintenance of a solar plant. Alarms & security - Datalogger and SCADA room.

Introduction to wind power Components of wind turbine generator (WTG) – Windmill - principle of operation and types - Elements of a wind mill - Minimum threshold - nominal speed during operation and out of service - high speeds of wind energy - Speed governor and control of transmission of energy - Electrical generator and Charge controller for windmill - Small(mini)hydro electricity generation and charge controller - Basics of other renewable energy resources for power generation – Wind mill suitable for integration with solar PV plant and its integration.

Unit IX: Maintenance of PV System (10 Questions)

SOP (Standard Operation Procedures) of PV system - Types of Maintenance (Preventive/ Corrective/ Condition Based) - Electrical maintenance/ Solar Panel maintenance/ Battery maintenance/ Charge Controller maintenance / Solar Panel maintenance.

Unit X: Manufacturing of Solar Panel (10 Questions)

Skills for incoming inspection of PV cells - Making of cell string - Parts of solar panel - Assembly of panel parts - Framework and sealing of panel.

Testing and certification - Quality standards - Manual and automatic manufacturing.

Solar water treatment plant - Solar air conditioning - Solar refrigeration - Solar agricultural products– sowing, digging, fertilizer or pesticide spraying.

Introduction to solar energy technologies for decentralized energy supply.

Solar cookers for domestic and community cooking - Solar Sprinklers for drip irrigation - Solar water pumping - Solar dryer - Solar air Heater - Solar Traffic Light - Solar distillation - Solar Pond.

National and international energy policies - National Solar Mission - Renewable Purchase Obligation Implementation at state level - Loan and promotional schemes - Incentives, subsidies & concessions - Solar roof top business models - Administrative processes - Details of various websites and mobile apps where policies can be accessed.

40. Trade - Surveyor

(ITI Standard)

Code: 387

Unit I: Basic Engineering Drawing (20 Questions)

Role of Surveyor:

Know about the role of a surveyor - State the importance of survey.

Layout of drawing sheets and title block:

State the measuring of the term 'Layout' of drawing sheet - List the different layout styles of drawing sheets - Explain margin, frame, title block etc.

Free hand sketching:

State the need free hand sketching - List the situations wherein free hand sketching is useful.

Drawing equipment - Drawing board, T-Square:

State the construction and use of drawing boards and 'T' square - State the standard sizes of drawing board as per IS: 1444-1989 - State the standard sizes of 'T' square as per IS: 1360-1989 - State the construction and uses of drafting machine - Select the pencil grades for different drawing application - Select the purpose of erasing shield - State the use of set squares in drawing work.

Folding of sheets:

Explain the method of folding in different size of drawing sheets.

Lettering styles:

Recognize different lettering styles - Designate the letters and numerals as per IS norms - State standard properties for height, width and spacing of letters.

Scales:

State the necessity of scales - Explain representative fraction (RF) - List the types of scales - Explain plain, Diagonal scale, comparative scale and Vernier scale.

Dimensioning:

Explain the types of dimensioning - Explain the elements of dimensioning - Explain the methods of indicating dimensioning - Explain the arrangement of dimensioning.

Types of lines and angles:

Define points and lines - State classification of lines - State the different types of angles - Explain the method of measuring angles.

Triangles and their properties:

Define triangles - Name the different types of triangles and state their properties.

Quadrilaterals and their properties:

Define a quadrilateral - Name the quadrilaterals - State the properties of quadrilaterals.

Polygon and their properties:

Define a Polygon - Name the Polygon in terms of the number of sides - State the properties of Polygon.

Unit II: Chain Surveying (30 Questions)

Introduction about Surveying:

Define Surveying - State the object of surveying - State technical terms - State the classification of Surveying - State the principles of Surveying - State the work of Surveyor - State the accuracy in chain Survey - State steel band

Measurement of distance by a chain and chaining:

State the methods of determining distance - State chaining and chaining a line - State unfolding the chain - Describe the reading the chain - State folding the chain - Calculate the errors in chaining.

Introduction about chain survey instruments:

State the construction and uses of the following chain survey instruments.

Ranging:

State ranging - State the necessity of ranging - State the types of ranging - Interpret the signals surveyor and the corresponding action by assistance.

Chaining on sloping ground:

Explain the methods of changing on sloping ground - State necessity of calculating horizontal distances.

Offset and Offsetting:

State the meaning of offset and offsetting - State the classification of offsets, its limits and its definition - State the methods of taking offsets for various site conditions.

Obstacles in chain surveying:

Define obstacles - State the three types of obstacles - Calculate the obstructed distance.

Introduction used for setting out right angles:

List out the instrument used for setting out right angles - State the types of cross staff and optical square - State the construction of cross staff and optical square - Explain the principles of optical square - State the uses of cross staff and optical square.

Introduction about triangulation survey:

Define the triangulation and traverse in survey - State closed and open traversed survey - State the three types of survey lines in triangulation

Explain about field work.

Calculation of area:

Calculate the areas of an irregular field - Apply geometrical formula for calculating the area - Describe the construction and use of planimeter.

Unit III: Compass Surveying (10 Questions)

Identification and parts of instruments in compass survey:

State about traversing - State types of compass - Name the prismatic compass and construction - Construction of surveyor's compass

Determining the bearing of a given triangular plot ABC and calculation of included angles:

Calculate angles from bearings - Calculate bearing from angles.

Determining the bearing of a given pentagonal plot of ABCDE and calculating included angles magnetic declination and plotting of compass survey:

Calculate the angles from bearing for a closed traverse - Calculate the bearing from angles for a closed traverse - Calculate the bearing of a pentagon - Define the dip of the magnetic needles - State the magnetic declination and variations - Calculate true bearing - State local attraction and its elimination - Explain about errors and its limits - State the testing prismatic compass.

Unit IV: Plane Table Surveying (10 Questions)

Setting up of plane table and methods of plane tabling:

State plane tabling - Name the instruments and accessories used in plane tabling - State the construction and uses of instruments accessories of plane tabling - Explain about the setting up of plane table over a station - Explain about leveling, centering and orientation in plane tabling - Explain the methods of plane tabling

Methods of plane table survey:

Methods of plane table survey - Radiation methods of plane table survey - Intersection methods of plane table survey

Traversing method of plane table survey:

State traverse methods of plane table survey - Conduct traverse methods of plane table survey.

Locate and plot new building by two point and three point problem: Define about resection - State two and three point problem - Describe Lehman's rule - List out the errors in plane tabling - Describe the advantage and disadvantage

Prepare a road map for 1/2 km showing details on both sides:

Prepare a road map and locate the details on both sides

Inking, finishing, colouring and tracing of plane table map:

Explain about colouring of surveying symbols - Explain the importance of tracing - State the techniques/order of tracing a drawing - State the different types of reproduction of drawings.

Minor instruments used with or without plane tabling:

Explain about the construction and uses of Abney level, tangent clinometers, De Lisel's clinometers.

Unit V: Levelling & Contouring (20 Questions)

Instruments Used for Levelling:

Explain the tilting level and auto level - Explain the construction of dumpy level - Explain the classification of leveling staff.

Introduction of contouring:

Define contouring - Explain the terms in contouring - Narrate the characteristics of contour

Topography and contour:

State Topography - State contour.

Tracing of grade contour:

Trace the contour gradient for alignment of roads, railways, etc - Determine the volume of earth work and capacity of reservoir.

Computation of volume:

Explain the various methods for the quantity of earth work - Compute quantity of earth work by average depth method - Compute the quantity of earth work by trapezoidal and primordial formula

Unit VI: Theodolite (40 Questions)

Introduction to theodolite:

Explain the uses of the theodolite - Explain the classification of the theodolite - Explain the designate of the theodolite

Temporary adjustment of theodolite:

Set up and perform centering of the instrument - Level up the theodolite

Eliminate parallax

Measuring horizontal angle-repetition method:

Explain the repetition method - Stage advantage of repetition method

State errors which are not eliminated by repetition method.

Measuring vertical angle:

Define vertical angle - Differentiate angle of elevation and angle of depression - Explain how to measure vertical angle

Deflection angle and direct angle:

State deflection angle - Differentiate right deflection angle and left deflection angle - State the direct angle - Differentiate deflection angle and direct angle

Prolonging a line:

State the method for prolonging a line - Compare the method for prolonging a line - State most suitable method for prolonging a line

Intersection of two straight lines:

Explain method one: to find intersection point of two lines - Explain method two: to find intersection point of two lines

Laying of a horizontal angle:

Explain laying of a horizontal angle by ordinary method - Explain laying of a horizontal angle by repetition method - Find equivalent linear distance for an angular value

Traverse:

State uses of traverse surveying - State types of traverse - Differentiate open and closed traverse

Traverse checking:

Explain the checks for open traverse - Explain the checks for closed traverse

Classification of traverse:

Classify traverse based on the instrument used - Explain method of traversing - Explain how to measure traverse length in theodolite traversing - Explain how to measure traverse angle in theodolite traversing

Theodolite traversing method:

State methods of theodolite surveying - Explain loose needle method - Explain fast needle method - Compare loose needle and fast needle method

Theodolite traversing method II:

Explain include angle method - Explain direct angle method - Explain deflection angle method - Explain azimuth method

Theodolite phases:

Explain theodolite traversing phases

Closing error:

Define closing error - Find magnitude and direction of closing error

Latitudes and departures:

Determine latitude - Determine departures - Balance the traverse using transit method - Balance the traverse using Bowditch's (mathematical) method

Balancing the traverse:

Explain balancing the error - Describe various mathematical and graphical methods of balancing the traverse

Omitted measurements:

Describe omitted measurements - List out and explain the classification of omitted measurement

Trigonometric leveling (indirect leveling):

State advantage of indirect leveling - Explain various cases of trigonometric leveling - deduce the reduce level using the appropriate formula

Introduction to curves:

Explain the necessity for the provision of curves on road and railway -Explain the classification of curves - Explain the different terms used in curve

Setting of horizontal curve by linear method:

Determine the elements of curve - Determine the offset from long chord - Explain the method of setting cut curve by offset from long chord

Setting out curves by angular methods:

Determine the deflection angles of chords - Narrate the procedure of setting out of simple curve by one theodolite and tape method

Unit VII: Tachometry (10 Questions)

Methods of tachometry:

List the methods of tachometry - Explain the fixed hair method - Explain the movable hair method

Tangential method of tachometry:

Explain the tangential method of tachometry - Explain the construction of substance bar - Explain the substance method of tachometry

Triangulation:

Explain the term triangulation

Unit VIII: Modern Surveying Instruments (25 Questions)

Digital theodolite:

Explain the features of the digital theodolite - Explain the difference between theodolite and digital theodolite

Total Station:

Describe the features of the total station - Explain evolution of total station from the conventional equipment - Narrate the benefits of total station

Remote sensing:

Explain remote sensing and photogrammetry.

GPS:

Explain the features of global positioning system (GPS) - Narrate the use of GPS and method of surveying for accurate output - List the benefits of GPS

Unit IX: CADD (25 Questions)

Introduction to cad:

Explain the term CAD - Explain the use of CAD

Draw tool bar:

Explain draw commands in CAD - Explain the method of drawing geometrical shapes in CAD

Layers:

Explain the dimensioning method in CAD - Explain the use of object snap in CAD

Modifying tool bar:

List out various modifying tools in CAD - Explain the uses of modifying tools in CAD

Printing cad drawings:

Explain the steps involved in plotting in cad

Unit X: Building & Drainage (10 Questions)

Building Drawing:

State the requirement of a good building drawing - State the method of drawing plan, elevation and typical section - State the scales used in building drawing - State Dimensioning and printing for building drawing.

Drainage:

State drainage and surface drainage - State four shapes of surface drainage.

41. Trade - Technician Medical Electronics

(ITI Standard)

Code: 549

Unit I: Safety and Measures and First Aid Mechanism, Classifications of Cables, Soldering and Desoldering Stations (10 Questions)

General safety precautions in Hospital - PPE Equipments – First aid Mechanism – Effect of Electrical shock and injuries - Cables used in Electrical and Electronics Industry – Types of Soldering Guns - Temperature & Wattage of soldering - Types of Soldering Tips - Solder Materials & Grading - Use of Flux, Wax & Other Materials - Selection of Soldering Gun - Soldering & Desoldering Stations.

Unit II: Basics of Electrical Terms, Electrical Motor and Measuring Instruments (20 Questions)

Basic Electrical Terms – Electric Charge - Potential Difference (Voltage) - Current - Resistance - Basics of AC & DC – AC Term - +ve& -ve cycle - Frequency - Time period - RMS (Root Mean Square) - Peak & Peak-to-Peak (P-P) values - Instantaneous Value - Properties of Materials – Conductors – Insulators – Semiconductors - ICDP Switch – MCB – Energy Meter - Ohm's Law & Its Variables - Single phase & 3 Phase power - AC Motors (Single & Three Phase) - Conventional Speed Control Methods for AC Motors - DC Motors - Series DC Motor - Shunt DC Motor - Compound DC Motor - Speed Control Methods & Applications of DC Motors - Measuring Instruments - PMMC Ammeter (Permanent Magnet Moving Coil) - Conversion of Ammeter to Voltmeter - Analog Multimeter - Digital Multimeter (DMM) - Digital LCR Meter (Inductance, Capacitance, Resistance Meter)

Unit III: Electronics, **Power Electronics and Special Semiconductors (40 Questions)**

Transistor Basics & Characteristics - Amplifiers & Their Characteristics - Field Effect Transistors (FETs) & Power Electronics components – Transistor Application - Types of amplifiers - RC Coupled Amplifier (Single & Double Stage) - Transformer Coupled Amplifier - Class B Push-Pull Amplifier - Audio Amplifier - FET Common-Source Low-Frequency Amplifier - FET Common-Drain (Source Follower) Amplifier - Diode Shunt & Series Clipper Circuits - Clamping/Limiting Circuits - RC-Based Differentiator - Transistor Power Ratings & Heat Dissipation.

Analog and Digital Signals - Logic Levels of TTL & CMOS - Number Systems & Codes - Logic Gates & Their Truth Tables - Digital IC Tester - Logic Families & Their Comparison - Combinational Logic Circuits - Adder Circuits & Arithmetic Operations - Magnitude Comparator - Availability of Logic Gates in IC Packages.

Types of Multivibrators - Types of Multivibrators - Monostable Multivibrator - Bistable Multivibrator - RC & RL Circuit Time Constants - 555 Timer IC - Monostable, Astable, and VCO Mode - Positive Feedback in Oscillators - Linear IC Tester - Integrator Circuits - Differential Amplifier - Op-Amp 741(Inverting & Non Inverting) - Linear & Non-Linear Applications of Op-Amps - Biomedical Instrumentation Amplifier - Oscillators using Op-Amps - RC Phase-Shift Oscillator - Wien Bridge Oscillator - Op-Amp Based Converters - Voltage-to-Current Converter - Current-to-Voltage Converter - Op-Amp Applications - Peak Detector - Precision Rectifier - Triangular & Square Wave Generator.

Fuses & Ratings - Single & Three-Phase MCBs - Single-phase ELCB - Power & Phase Relations - Three-phase Transformers - Contactors & Their Types.

Unit IV: SMD Components, Semiconductor Devices and Stabilizers (10 Questions)

PCB Design & SMD Components - Semiconductor Devices & Diodes - PN Junction & Biasing of Diodes - Rectifiers & Voltage Regulator - Power Supply & Stabilizers - Voltage Stabilizers.

Unit V: Human Anatomy and Biomedical Equipment and Sensor (30 Questions)

Human Body Cells & Organelles - Types of Tissues in the Human Body - Functions of Major Human Organs (Brain, Heart, Lungs, Liver, Kidneys, Stomach, Intestines (Small & Large), Skin, Pancreas, Reproductive Organs) - Medical and laboratory equipment – Balances - Hot Plate - Magnetic Stirrer – Centrifuges - Hot Air Oven – Incubator - Water Bath – Nebulizer – Sphygmomanometer - Baby/Clinical Incubator - Radiant Warmer - Laboratory Equipment – Microscope – Colorimeter - Spectrophotometer (VIS & UV) - Laboratory Tests Based on Colorimetry & Photometry - Flame Photometry – Electrophoresis – Densitometry - pH Meters - Semi-Auto Analyzer - Blood Cell Counter & Blood Gas Analyzer - Bio-Potential Electrodes - Cells & Bio-Electric Potentials - IR LEDs - Photo diodes - Photo transistors - Optical Sensors & Opto-Couplers - Laser Diodes - Biomedical Sensors - Types of Lights Used in Electronics & Medical Applications (UVB Lights, Halogen Lights, Tube Lights, UV Lights, IR (Infrared) Lights, CFL (Compact Fluorescent Lamp), Phototherapy Lights.

Safety precautions for hospital gas plants - Types of gases used in Hospitals - Gas plant layout

Electric Stimulation of Nerve & Muscle - Types of Currents Used in Therapy - Methods of Heating Tissues - Advanced Therapies (LASER Therapy, Ultrasonic Therapy, Ultra-Violet Radiation Therapy, Cold Therapy (Cryotherapy)

Unit VI: Earthing, Batteries, Inverters, and UPS (20 Questions)

Electrical wiring for Single phase and Three phase systems - Earthing and earth resistance measurement calculation of power and power factor - Review on Batteries – Battery and cell construction - Types of Cells - Materials Used in Cells & Batteries - Specifications of Cells & Batteries - Charging Process & Efficiency - Selection of Cells & Batteries - Use of Hydrometer - Types of Electrolytes - Propagation Delay - Power Dissipation & Noise Immunity - grouping- charging - Battery charging circuits used in Inverters and UPS – Maintenance of batteries – Inverter - power rating - change over period – their principle & operation-change over period – installation of Inverters - Protection circuits used in inverters – battery level, over load, over charging etc - Various faults and its rectification – concept of UPS- principle of different types - Specifications -faults and their remedies of different types UPS -Concept of UPS, OFF LINE and ONLINE – difference between inverter and ups – Selection of UPS – calculation of load power - line interruptive UPS, online ups circuit description and working- controlling circuits, micro controller circuits, power circuits, charging circuits, alarm circuits and indicator circuits.

Unit VII: Fibre Optic Communication, CCTV, Microprocessor and Microcontroller (20 Questions)

Intro to optical fiber as a transmission media - its advantages over other media - Working principle of transmitter and receiver - Application and advantages – properties - testing, losses, types, specifications-joints, splicing and related equipment- precautions- laying of cables

Introduction of CCTV - computer hardware, software's installation – multiple frame split in digital TV-restore old memories - format new & old hard disk

Intro to 8085 Microprocessor – Architecture – pin details - Bus System – function of ICs such as decoders, buffers, latches – memory ICs such as RAM, PROM/EPROM,8255 – instruction set covering data transfer logical, arithmetic, serial communication etc - Differentiate Microprocessor and Micro controller - Architecture of 8051 - pin diagram- pin diagram and various on chip resources - Types of memory – on chip, external code memory, External RAM - Register Banks and their use - Memory mapping of the bit addressable registers (bit memories) - Instruction set and various types of instructions - Special function registers (SFRs) and their configuration for various applications. - Input / output ports and their configuration - Implementation of various Timer and counting functions - aspects of serial communication

- Utilization of on-chip resources such as ADC etc - Assembly software and compilers for 8051 Microcontrollers - 8052 and its difference with 8051.

Unit VIII: Demonstrate ICU Department Functions, Equipments and Basic Human Rating Chart (20 Questions)

Charts of internal organs of human body – kidney- eye – ear -brain – heart – blood circulatory system – skeletal system – respiratory – nerves – digestive – reproductive – history of bio medical engineering instrumentation – MAN instrumentation - Physiological system of the Body - Medical Terminology - various departments in hospitals – classification of hospitals

Unit IX: Execute the Operation of Different Imaging Equipment Used in Hospitals (20 Questions)

Introduction to anatomy -human physiology – electro physiology - multipara monitor – ultra sound doppler – fetal monitor – pulse oximeter – elements of intensive care monitoring – patient monitoring displays – defibrillators – pacemakers – EMG - EEG – video monitors - recoders – strip chart recorder – galvanometric recorders – ventilators – inhalators - respirators – humidifiers – aspirators – diathermy

Different components of Dental X-ray machine - Collimator, Bucky Grids, Relays, contactors, Switches, Interlocking circuits – basics and block diagram of ultra sound scanner - Transducer theory & types - different modes ie. A, B, M – colour doppler ultra sound scanner - X-ray basics – components and block diagram - H.T. generator, x-ray tubes, Collimator, Bucky Grids, Relays, contactors, Switches, Interlocking circuits – scattered radiation – digital x-ray concepts – x-ray films – screens darkroom system – CT scanner – MRI – mammography – bronchoscope

Unit X: Development of Bio- Medical Department in a Hospital (10 Questions)

Role of biomedical engineer - record maintenance of Department - NBEA license (National Biomedical Engineers Association) – MCEBTI Bangalore (ITI MEDICAL ELECTRONICS BIOMEDICAL) - MIS NCVT (National Council for Vocational Education and Training Management Information System.) - Introduction of different types of License required for Hospitals - NABH (National accreditation Board for Hospitals and Health care) - AERB (Atomic Energy Regulatory Board), ARRT (American Registry Radiologic Technologists) - RMDC (Registered Diagnostic Medical Sonographers), PC - PNDT (Pre Conception and Pre-Natal Diagnostic Techniques)

42. Trade – Textile Mechatronics

(ITI Standard)

Code: 568

Unit I: General Safety Precautions and Basic terms in Electrical and Electronics (10 Questions)

Industrial safety precautions - Safety devices, safety signs - First aid - Fire extinguishers - Fundamentals of electrical terms and definitions, and their units - Symbols - Effects of electricity – Conductor – Insulator - Semiconductor - Type of cables – Work, power and energy, Potential Energy and Kinetic Energy - ohm's law - series and parallel circuit with simple problems.

Unit II: Cells, Subsystems and Wiring Systems (10 Questions)

Primary cells - Types of cells-defects - Applications Secondary cells - Types of cells - Types of charging, care and maintenance - Applications - Electromagnetic induction Faraday's Law - Lenz's Law - D.C generator – Construction - Working principle - Types of generator and applications - Different types of motors, AC/ DC motors – Construction - Working principle - Types and applications - Necessity of starter - Types. Different types of Pump motors - Wiring - Types of wiring - Application of different types of wiring - Wiring accessories.

Unit III: Textile Mechatronics Tools and Equipments (20 Questions)

Measuring tools – Steel rule – Vernier calliper – Spirit level – DC Ammeter, AC Ammeter – AC Voltmeter, DC Voltmeter – Multimeter – Kilowatt meter – Frequency meter – Megger – Single phase power factor meter – Series type ohm meter – Shunt type ohm meter – Soldering iron and De-soldering iron.

Hand Tools: Combination plier – Plier side cutting – Pliers Flat nose – Pliers long nose – Screw driver - Heavy duty – Screw driver square blade – Firmer Chisel – Marking Gauge – Combination bevel protractor – Cold Chisel flat – Ball Pein Hammer – Cross Pein Hammer – Flat file – Triangular file – Spanner double ended set – Hacksaw frame – Steel Measuring Tape.

Bench vice – Pipe Wrench – Spanner – Vernier caliper – Ring spanner – Grip Plier – Inner caliper – Outer caliper – Box spanner – Torque Spanner – File Swiss type needle set – Shore hardness tester for rubber – Needle file – Nylon hammer – Puller – Copper tube cutter – Ratchet brace – Ratchet bit – Vernier Caliper – Snips – Conduit Pipe die set – Tong Tester – Ohm meter – Grimping tool – Blow Lamp – Multimeter – Ladle – Pipe Vice.

Unit IV: AC Circuits, AC Motors and Transformers (15 Questions)

Fundamental terms in A.C circuits - Types of A.C circuits – Power Factor (PF) - Advantages of good P.F disadvantages of poor P.F - Improvement of P.F

Poly phase star and delta connections - Line voltage - Phase voltage - Line current - Phase current - Measure the current voltage P.F. Frequency, power of a simple A.C circuits.

Alternators - Construction - Working principle - Voltage regulations - Phase sequence A.C motor – Types - Starter and their types.

Different types of single phase and Three Phase motors Working Principles.

Transformer – Working Principle – Different types & their application.

Unit V: Illumination systems, Conductor, Semiconductors and Transistors (20 Questions)

Connecting & testing lamps & energy efficient lamps - Application and Norms for illumination in textile mills - Fault finding, rectification and servicing of different types of domestic and Industrial appliances.

Illumination - Incandescent lamp - Fluorescent lamp – Mercury Vapour lamp - Applications care and maintenance - Working and maintenance of domestic and Industrial appliances - Heaters/ Furnaces/ Pump set.

Conductor, Insulator - Semiconductor, types of solder, Types of fluxes, Methods of soldering, Resistors, Capacitors, inductors etc. types specification and their applications. Study of solid state device such as diodes, transistors SCR (Silicon Controlled Rectifier) and ICs (Integrated Circuits). Semiconductor theory P-type and N-Type Semiconductors. Diode-Constructions working rectifiers, filters - Soldering & De-soldering practice identifying simple meters - Study the Multimeter – Verification of Ohm's law - Identification and testing the given components - Identify the colour code of Resistors - Identify VI characteristics of diode Half wave & Full wave rectifiers.

Voltage regulator circuit – Input - Output characteristic of Transistors at common base - Common collector - Common emitter modes - Study of Integrated (IC) circuit - Construction of Transistors & Amplifiers - VI characteristics of SCR - Speed control of D.C motor using SCR - Checking of FET amplifier Ckts - Identification of UJT relaxation oscillator - Transistors-construction working amplifier circuits SCR, FET (Field Effect Transistor) , UJT (Uni Junction Transistor) , DIAC (Diode for Alternating Current) & TRIAC (Triode for Alternating Current) constructions working applications circuits - Study of Integrated Circuits (IC)

Unit VI: Logic Gates and PLC (20 Questions)

Study of different logic gates - Testing of gates using ICs - Constructions of Timer circuits using 555 ICs - Study of commonly used Transducers - Comparisons of PLC with conventional machine - Functions of keys on Programme Development Terminal (PDT) - Introduction to logic gates. Explanation of basic logic gates, OR, AND, NOT, NOR AND, EX - OR etc. Truth table using diodes, transistors, resistors. Logic gates using etc. Flip-Flops-Counters, Timer circuits.

Introduction to Advanced Automation System: Introduction to PLC and their programming methods - block diagram of PLC - working of PLC - Input and output units - Role of PLCs in textile industries - logic gates - Identification of PLC blocks.

Microprocessor - Working principle & block diagram – Transducers - Thermocouples, thermostats, LDRs, LVDTs, strain gauges, magnetic pickup photo diodes, photo transistor. Over current relays, D.C Motor controllers photo electrical relays - Concept of PLC Block diagram - Comparison of PLC with conventional terminal / relay. Function of various programmes development terminals (PDT).

Unit VII: Operation of different machines of spinning mill, and study of their components (30 Questions)

Introduction - Objectives of blow room- identification of components of the machine, and its functions - Objectives of carding - Working mechanism of carding - Identification and importance of components in carding - Objectives and working of lap formers & Comber- Identification of machine components and its functions - Objectives and working Draw frame - Identification of machine components and its functions - Objectives and working Speed Frame – Simplex – Spinning - working Mechanism - Auto cone Winding - Sequence of Process - Mechanism of Cone/cheese – Winding - Working principle and operations.

Applications of Mechatronics in Blow room & Carding - Electrical and electronics involved in Blow room - regulation of cotton flow-detection of foreign particles – Coiler - stop motion units - Electric motors – working & Principle of operation.

Introduction to electric drives - Drives involved in textile machines and their importance - Can changer mechanism, principle of auto leveler, importance and its functions, control systems involved in Auto leveler, production & monitoring system - Application of mechatronics in comber, draw frame, lap fromers and speed frame: Working principle of Comber - Starting mechanism - Electronics involved in Doffing operation - Draw frames - Working principle of Speed frames - Controls system in speed frame machines - Cone drum mechanism.

Unit VIII: Different Hydraulic & pneumatic applications in textile machines (25 Questions)

Introductions to Hydraulics - Application of hydraulics - Fluid couplings - Waste Evacuation system – Spinning - Working principle of pneumatic speed variator - Doffing sequence - Electronics in doffing sequence - Study of feedback elements and control elements - Determination of setting, speed, production, efficiency and machinery particulars for carding machine.

Importance of overhead cleaners and their operations-drives, motors sensors and transducers operations in overhead cleaners - Importance of OE Spinning - Electronic controls - Drives, motors and mechanism in OE Spinning. Principle of Winding - Electronic controls in Auto corner - Principle of conveyor operation - Determination of setting, speed, production, efficiency and machinery particulars for draw frame - Determination of setting, speed, production, efficiency and machinery particulars for speed frame - Determination of setting, speed, production, efficiency and machinery particulars for ring spinning & cone winding.

Unit IX: Operations of weaving preparatory and weaving machines (30 Questions)

Principles of weaving preparatory machines – Warping and sizing machines - Determination of setting, speeds, production, efficiency and machinery particulars for preparatory machine - Identification of weaving mechanical, electrical &electronics components of the machine, setting & maintenance.

Principles of weaving machine - Determination of setting, speed, production, efficiency and machinery particulars for weaving machine - Identification of mechanical, electrical & electronics components of the machine, setting & maintenance.

Working principles of different types of looms - Handloom & Power loom. Turning, setting & production. Identification of mechanical, electrical & electronics components of the weaving machines.

Pneumatic Automations In Textile Machines: Introduction to pneumatics - Application of pneumatics in blow room - Pneumatic controls in carding machine - Components involved and their control systems - Pneumatic controls in comber machine, Components and its functions and identification of basic components.

Pneumatic controls in sliver lap and ribbon lap former - Components involved and their control systems - Pneumatic controls drawing machines and ring frames components involved and their basic operations - Pneumatic controls in winding machines - Components involved and their control systems - Simulation of electro-pneumatic systems - Simulation of electro-pneumatic systems, Proximity switches, Optical sensors and Capacitive sensors.

Working of flat /circular knitting machine - control, Operations and their importance - Calculation of speed & Production. Study of different mechanisms of flat / circular machines - Identification of mechanical, electrical & electronics components of the machines, setting & maintenance.

Unit X: Human Machine Interface (HMI) Panels in Textile industries and Quality concepts (20 Questions)

Role of HMI (Human Machine Interface) panels in textile industries - Hand held operating system - Introduction to working of modern spinning & weaving machine - Introduction to HMI Software - Calculation, setting of modern spinning & weaving machines - Identification of mechanical, electrical & electronics components of the machine, setting & maintenance.

Quality concept and certifications ISO9000, SA8000, ISO14000, 5S system - Industrial safety & Health hazard.

43. Trade - Turner, Tool and Die Maker

(ITI Standard)

Code: 552

Unit I: Safety and General Precautions and First Aid (10 Questions)

Safety and General Precautions observed in the Industry- Protective Personal Equipment (PPE) - Safety -First Aid Method and Basic Training - Remember ABC – Electrical Maintenance and Safety – Response to Emergencies - Road Safety and Signs - Disposal of Waste material – Colour Code for Waste Segregation - Importance of housekeeping - 5s – Confused Space Work and Material Handling – Moving Heavy Equipments – Fire Extinguishers –Occupational Safety & Health - Safe use of tools and Equipment used in the trade.

Unit II: Marking tools and Measuring tools and Accessories (20 Questions)

Measuring Tools: Steel Rule – Types of Vernier Caliper – Types of Micrometer – Vernier bevel protractor – Combination set – Try Square – Vernier height gauge –Screw pitch gauge – Radius gauge – Wire gauge – Plug gauge – Ring gauge – Telescopic Gauge - Dial Test Indicator its uses and Care – Sine bar and Uses – Slip Gauge – Checking of Taper with Roller Calculation.

Marking Tools: Scriber- Calipers- Type of Calipers – surface gauge – divider – Punch- Straight Edges- Surface Plate.

Hand Tools: Hammer –Screw driver – Spanners -Tap Wrench.

Cutting Tools: Chisel – Hacksaw - Type of Hacksaw Blades – Pitch – Different Type of Punches – Files – Different Type- Uses- Grade – Shape – drills – Different Parts, Types and Sizes – Tap & Die –Tap Extraction - Die and Die Stock – Method of Removing Broken Tap and Studs - Lathe Cutting tools – Type of Reamers – Knurling Tools.

Holding Tools Accessories: Vice – Types of Vice – Vee block – Drill chuck – Lathe Chuck – 3 jaw Chuck – 4 Jaw Chuck – Self Chuck – Collet - Face Plat – Driving Plat – Catch Plat – Various Types of Lathe Centres – Lathe Carriers – Types of Lathe Mandrels - Travelling Steady – Fixed Steady –Angle Plat – Jigs & Fixtures.

Unit III: Turning on a Lathe (35 Questions)

Main Component – Lever Positions & Lubrication Points – Different Parts Of Lathe - Classification of Lathe and Function and construction of Parts of Lathe – Specification of Lathe – Types of lathe drive its Merits and demerits –Description in details - head stock – Types of Tool post and setting - Conepully type – All geared type – Construction & Function – Tumbler Gear set – Reducing speed – necessary & Back Gear Unit Construction and Use – Knurling meaning – Necessity and types – Grades & Cutting speed for Knurling - Lathe Cutting Tools – Different Types – Shapes – Specification of Lathe Tools – Lathe Operations – Facing - Plain Turning – Step Turning – Taper Turning – Contour Turning – Form Turning – Chamfering – Cutoff –Threading –Boring – Drilling – Knurling - Eccentric Marking Vernier height gauge - Eccentric boring - Templates its function and construction – Toolmakers button and parts – Counter boring – Counter Sinking - Spot Facing - boring of split bearing – Holding split bearing Fixture and use in turning – Angles of Lathe Cutting Tools - Combination Drill (Centre Drill - Appropriate Selection of Size from Chart, Drill Chucks – Lathe Accessories

Unit IV: Taper Turning and Form Turning (10 Questions)

Taper - different method of expressing tapers and Standard Taper its Use - Important dimensions of taper – Taper turning by form swivelling, compound slide, Taper turning Attachment - Method of taper angle measurement – Form tool function types and use – Template purpose & use - Jig and fixture definition type and use – Chip breaker on tool, purpose and type – Checking of taper with sine bar and roller – Cutting speed, feed, turning time and depth of cut calculation.

Unit V: Allied Operation and Heat treatment (10 Questions)

Basis process of soldering – welding and brazing - Basis process of Welding – Gases used in gas welding - welding Nozzles.

Heat treatment – Meaning & Procedure - Hardening and Tempering – Annealing of steel – carburizing of steel – Heat treatment purpose – Normalising – Surface Hardening Critical – Lower and Upper.

Unit VI: Eccentric turning and boring (10 Questions)

Eccentric Marking Vernier height gauge - Eccentric boring - Templates its function and construction – Toolmakers button and parts – Counter boring - boring of split bearing – Holding split bearing Fixture and use in turning.

Unit VII: Thread cutting and other forms of thread (35 Questions)

Different types of screw thread - Form and elements and application – Drive train – change gear formula & Calculation – checking of thread by using screw thread gauge and plug gauge.

Different methods of forming threads – Calculation involved in core dia – simple gearing - driver & driven and lead screw pitch thread to be cut - Thread chasing dial function constructions and use.

Different profile of metric - BA and with worth and pipe thread – Calculation involving gear ratio and gearing. Screw thread micrometer and use.

Multiple thread function use – Multi start thread and methods – Calculation involves depth core and pitch and Proportion Acme thread & Buttress thread.

Calculation involving gear ratios - metric threads - cutting on inch lead screw lathe and vice versa - metric threads using inch leadscrew and vice – Calculation involving fractional thread odd & even threads.

Multistart thread – different methods of multistart thread - Calculation involving shape of tool (Square thread tool)

Helix angle and its effects on threading tool clearance angles – Tool life and negative top rake angle application and performance - positive top rake angle – Thread on Taper Surface.

Unit VIII: Advance Turning and CNC Turning (35 Questions)

CNC Technology Basics – Types of CNC Lathe – Control system and specification – Preparation of Part Programming - Axis Convention of CNC Machine – Feedback control system and Interpolations – Concept Co – ordinate geometry – Tool Offset- Job Offset – Trouble Shooting in CNC Machines.

Programming sequence G codes and M codes CNC – Machine Operation Modes, Jog Mode and MPG and Edit Mode - Fanuc – Canned Cycle – Cutting Speed and Feed – Process Planning & Sequencing tool layout & selection.

Machining Operation and tool path – Tool nose radius Compensation - Selection of Cutting Parameters from a tool Manufacturers – Factors affecting Quality & Productivity – Input and output Data – DNC system – Use of CAM Programme.

Unit IX: Special Operation on lathe and Special job Maintenance (25 Questions)

Preventive Maintenance -Lubrication functions and type source - method of lubrication – Grinding wheel – abrasive – grit & grade and bond – Interchangeability Meaning – Quality control procedure & Production – Frequency Classification Symbol.

Mass Production - System of Limits – Tolerance – Fit Different Types – Symbol for Holes and Shafts – Hoe Basis & Shaft Basis etc. Representation of Tolerance in Drawing – As Per BIS 919- Unilateral and Bilateral System of Limit- – Terms used in part Drawing &Geometrical Tolerances – Symbols – Automatic lathe main parts - Different types – Tool holder & used.

Unit X: Metals and Non Metals Characteristics (10 Questions)

Selection of Metals – Properties of Lathe cutting tools – MS-HCS – HSS – Cemented carbide – Types & Uses – Properties of Good Cutting Tool Materials – Different Tool Materials – Sterlite – Coated Carbides-Ceramic- Diamond – Single Point Cutting Tool- LH Tool –RH Tool – Drills for Difference Material and Tool Angle –Different Types Material of Lathe Tool.

44. Trade - Welder [Gas and Electric]

(ITI Standard)

Code: 440

Unit I: Introduction and Definition of Welding (10 Questions)

Safety Precautions Shielded Metal Arc Welding (Smaw) & Oxygen Accetylene Welding (Oaw) Arc and Gas Welding Equipments, Tools and Accessories - Various Welding Processes and Its Applications - Arc and Gas Welding Terms and Definitions.

Unit II: Different Process of Metal Joining Methods (20 Questions)

Bolting, riveting, soldering, brazing, seaming etc. - Types of welding joints and its applications. Edge preparation and fit up for different thickness - Surface Cleaning - Basic electricity applicable to arc welding and related electrical terms & definitions - Heat and temperature and its terms related to welding - Principle of arc welding and characteristics of arc, Permanent and Temporary Joints.

Unit III: Set the Oxygen - Acetylene Gas Cutting Plant (Oagc) and Oxygen - Acetylene Welding (OAW) (10 Questions)

Common gases used for Welding & Cutting, Flame temperatures and uses. - Types of Oxygen - Acetylene flame Temperature and uses - Oxygen-Acetylene Cutting Equipment principle, parameters and application.

Unit IV: Arc Welding Power Sources (20 Questions)

Transformer, Motor Generator Set, Rectifier and Inverter Types of Welding Machines and its Care & Maintenance - Advantages and disadvantages of A.C (Alternative Current) and D.C (Direct Current) welding machines.

Unit V: Arc Welding Positions (30 Questions)

As per EN & ASME Flat, horizontal, Vertical and Over head Position - Weld Slope and Rotation - Welding Symbols as per BIS & AWS - Arc length – Types - Effects of Arc Length - Polarity: Types and its applications - Weld quality Testing & inspection, Common Welding mistakes and appearance of good and defective welds - Weld gauges & its uses.

Unit VI: Gas Cylinders and Regulators (20 Questions)

Calcium Carbide uses and Hazard – Acetylene Gas Properties and flash back arrestor – Oxygen Gas and its properties, uses in welding. Charging process of Oxygen and Acetylene gases – Color coding for different Gas Cylinders – Regulator – Single and Double Stage – Oxy and Acetylene Gas Welding System (Low and High Pressure) – Gas Welding Techniques – Rightward and Leftward Technique – Filler Rod – Flux – Specification and uses.

Unit VII: SMAW Defects (20 Questions)

Arc Blow – Causes and Methods of Controlling – Distortion in Arc & Gas Welding – Pipe Welding – Types of Pipe Joints – Positions – Difference between Pipe & Plate Welding – Pipe Butt Joint - Pipe Development for Elbow, 'T','Y' and Branch Joint.

Unit VIII: Arc Welding Electrode (20 Questions)

Types, Functions of Flux, Coating Factor, Sizes of Electrode Coding of Electrode as per BIS, AWS - Effects of moisture pick up. Storage and baking of electrodes - Special purpose electrodes and their applications. Weldability of metals, Importance of Pre heating, Post heating and maintenance of inter pass temperature.

Unit IX: Testing Welded Joints by Different Method of Testing (10 Questions)

Destructive Test - Nick Break - Free Bend – Tensile – Non Destructive Test - Dye Penetration - Magnetic Particle – X Ray – Gamma Ray.

Unit X: Gas Tungsten Arc Welding (Gtaw) & Gas Metal Arc Welding (GMAW) (Co2) Welding Process (40 Questions)

Brief Description - AC and DC Welding, Equipments, Polarities and applications. Various Welding Process **(GTAW and GMAW (CO_2))** - Power sources for **GTAW** - AC [Alternative Current] & DC [Direct Current] - Tungsten electrodes - Types & Sizes - GTAW and GMAW Torches - Types, Parts and their functions - GTAW filler rods and selection Criteria - GMAW - Wire Feed System – Shielding Gases (Argon, CO_2) –

Advanced Welding Process - Submerged Welding -Thermit Welding - Resistance Welding (Spot, Seam, Projection) - Friction Welding (Flash Butt) – Plasma Arc Welding and Cutting - Plastic Welding (Polypropylene(PP), Polyethylene (PE), Polyvinylchloride(PVC) - Induction Welding.

Workshop Calculation and Science: Unit, Fraction – Square root, Ratio and Proportions, Percentage – Material Science – Mass, Weight, Volume and Density – Heat & Temperature and Pressure – Basic Electricity – Mensuration – Trigonometry.

Engineering Drawing: Introduction – Drawing Instrument – Free Hand Drawing - Geometrical - Hand Tools, Measuring Tools – Fabrication Drawing, Sectional View of Different Types of Welding Joints and Pipe Joints – Symbols used in related Trades – Reading of Job Drawing of related Trades.

45. Trade - Wireman

(ITI Standard)

Code: 550

Unit I: Safety and Tools Handling (10 Questions)

Safety rules and signs – to prevent accidents -hazard identification- Warning Signs labels. Fire types and extinguishers -electrical fires - rescue operations and first aid- Waste material disposal-prevent environmental hazards –Factory safety - The use of Personal Protective Equipment (PPE) - Reason for shock – power failure – fire and system failure – BIS/ISI symbols of electrical accessories - 5S concept – trade tools and equipment – specification – uses – care and maintenance.

Unit II: Electrical Wire Joints and Cables (20 Questions)

Types of electrical wire and cables – specification – voltage grade – precaution – application –Different wire joints - stripping – skinning – SWG and micrometre - domestic, commercial, and industrial wiring system - wire and cables - Insulation - voltage grading - temperature rise, Insulator-semiconductors and resistor - soldering techniques - solder, flux- brazing, Crimping tools and thimbles–lugs and co-axial plug and socket.

Cables - advantages and disadvantages, various types – (PVC, XLPE, PILC, oil filled etc.) Cable insulation & voltage grades. Joints and terminations- pre-moulded, heat shrinkable, extrusion moulded joints Slip on, cold shrink terminations, Types of connectors - cable, current path.

Methods of conductor connection, contact resistance. Galvanic corrosion and use of bimetals. Connectivity - screen and armour, mechanical protection, Kits - joints and terminations.

Cable termination to equipment, Standards and testing; type, routine, field test, Stress control.

Unit III: Electrical and Electronics Circuits (25 Questions)

Fundamental of electricity – National electrical code 2011-terms and definition, measure resistance - voltage drop method, wheatstone bridge method –, Fundamental laws - Ohm’s Law and Kirchhoff’s Laws, Electrical circuits and networks – Law of resistance – types of resister – series and parallel connections and its characteristics, Magnetism – terms, materials and properties, Law’s of electro magnetism – solenoid – effects of current – EMF – (Self and Mutually Induced EMFs)-Capacitors Types– functions – grouping and uses of capacitors.

AC circuits – RL,RC and RLC – series and parallel connections- vector concept – inductive and capacitive reactance, effects, DC and AC system – advantage, related terms-frequency, instantaneous value, RMS value, average value, peak factor, form factor and impedance, Power – active and reactive – single phase and three phase system Advantages of ploy phase system –star and delta connections - balanced and unbalanced – problems, PN-Junction diode, Rectifier – half, full and bridge, resistance - colour coding, types, and characteristics, safety and disposal of electronic components.

Unit IV: Electrical Machines and Earthing (25 Questions)

DC machine–Principle, parts and uses - EMF equations –Exciting of Generators (Self and Separately). Armature reaction, Commutation, interpoles and connection of interpoles. Parallel Operation of DC Generators, Application, losses &efficiency, Principle and types of DC motors. Changing the direction of rotation, DC – motor starters, Methods of speed control of DC motors.

Transformers – Single and three phase - principle, construction and classification, Testing (OC and SC test).

AC Machines – Motor and Alternator - principle, construction and classification, AC motor starters and soft starter, Service, troubleshoot and maintenance.

Earthing – IE Rules – plate, pipe earthling, Earth tester/Megger, earth - resistance, leakage current, difference between grounding and earthling – Circuit main earth and portable.

Unit V: Power Generation and Distribution (20 Questions)

Power Generating system - Power generation, transmission and distribution (LV MV and HV) –Hydro, Thermal, Nuclear power plant etc. Types of distribution system substation – Indoor and outdoor and pole mounted – line protective devices, equipment's – switch gear , circuit breakers and switches, Protection scheme – current and potential transformer – protective relay and lightning arrestors

Unit VI: Measuring Instruments and Testing (25 Questions)

Measurement of electrical parameters - system maintenance. Instruments classification - analog and digital meters - voltage, current and resistance values.MC and MI meters measure - DC and AC currents - Wattmeters and energy meters - power consumption. Phase sequence and frequency meters stability and tong testers (clamp meters). MRI meters, Testing in domestic wiring - fault tracing, earth leakage tests, and insulation resistance checks & safety.

Unit VII: Illumination and Lighting Systems (20 Questions)

Law's Illumination – types – factors – intensity, advantages / disadvantage – applications, calculation of lumens and efficiency, Proper lighting - homes, offices, and industries, LED, CFL, spotlight, down light and strip light, HPMV lamp, Sodium vapour lamp and fluorescent lamps. Decorative and under-cabinet lighting - workspace visibility. DMX controllers - PAR lights stage lighting - LED video walls serve commercial displays. Motion sensor lighting saves energy and remote-controlled lights and fans enhance automation.

Unit VIII: Renewable Energy Systems and Electric Vehicles (20 Questions)

Renewable energy - power generation, solar energy - photovoltaic cells, charge controllers, and battery storage. Solar panel installation -tilt angles and sun exposure for efficiency. Solar water pumps and DC applications – ON/OFF Grid - Grid solutions, solar inverters - DC to AC. EV charging stations support electric mobility, requiring - battery maintenance and proper power distribution for public and home installations.

Unit IX: Control Panels and Wiring Installation (20 Questions)

Electrical circuit drawing – control element, equipment and symbols, Control panels - relay, ladder logic and wiring contactor, and overload relay wiring. Power distribution drawing

Control panel components - DIN rails, trunking, connector blocks, screw terminals, relays, contactors, protective units, fuses, fuse holders; chassis mounted, fuse-links, resistors; fixed, variable, capacitors, switches, lamps, labelling grommets and clips, Cable forming - template, wiring schedule, run out sheet, binding, continuous lacing, loop tie, lock stitch, finish knot, breakouts, lacing breakouts, spot ties, laying of wires, twisted pair, Cable markers and colour codes, Connections and routing of cables - Consideration of EMI/EMC, Conductors of different circuits.

Symbols and use of relay contacts: NO, NC, changeover, make/break after delay, Testing of various control elements and circuits.

Circuit breakers, fuses, MCCB, MCB, and ELCB for fault protection. Conduit wiring - surface and concealed PVC wiring, Cable forming and routing, Smart home automation wiring - lights, fans, and appliances. Estimation and costing.

Unit X: Domestic, Industrial Wiring and Winding (15 Questions)

Types of domestic wiring and industrial wiring - IE Rules related to wiring, National Building codes for house wiring, specification and types, rating & material, Terms - Maximum demand, Load factor and Diversity factor, Various wiring accessories/ electrical fittings Grading of cables and current ratings, Principle of laying out of domestic wiring - Voltage drop concept. IS 732-1863. Wiring materials - PVC cables, Indian standards regarding wiring materials, wiring estimation procedure, Branching of circuits - lighting and power.

Installation and maintenance - electrical appliances - Electric bells and buzzers, induction heaters and food mixers, Ceiling fans, washing machines, refrigerators, and pump sets- and their periodic servicing. Air conditioners (window and split). Industrial motors and pump, Battery maintenance and transformer winding. Wiring Estimation– domestic, commercial, and Industrial, smart wiring concept, Communication and entertainment wiring, Ground fault circuit interrupter.

Types of winding- Concentric, distributed – single / double layer winding and related terms.

Troubleshooting of single-phase - AC induction motors and universal motor.

Industrial Wiring – Adverse conditions affect the installation, Degree of mechanical and electrical protection, Peak-Non-peak Loads, Lighting Design - lighting power density, Estimation - load cable size - bill of material and cost - Inspection and testing of wiring installations, Special wiring - hospital, go down, tunnel and workshop, Danger notice as per IE rules.

Cable Management - Types of cables, uses, cable glands, IP ratings, IP Codes format. Importance of Bonding and grounding, various types. Testing of cables-locating faults, open circuit, short circuit and leakage in cables.

46. Trade - Workshop Calculation Science

(ITI Standard)

Code: 540

Unit I: Units, Fraction, Square Root, Ratio, Proportion and Percentage (20 Questions)

Classification of Unit system – Fundamental and derived units – System of International (SI) units – Measurement of units and conversion – Factors, Highest Common Factor(HCF), Lowest Common Multiple (LCM) – Simple and Decimal Fractions – Addition, subtraction, multiplication and division related problems - Square and square root problems – Applications of Pythagoras theorem – Direct and Indirect proportions – Percentage -Conversion of percentage into decimal fraction and fraction to percentage.

Unit II: Material Science and Heat Treatment (30 Questions)

Types of metals - Ferrous and Non-ferrous metals – Physical and Mechanical properties of metals – Iron, Cast iron, Steel – Alloy steel and Carbon Steel – Difference between Iron and Steel – Properties and uses of rubber, timber and insulating materials.

Heat treatment purpose and advantages - Process – Annealing – Normalizing – Hardening – Tempering – Case hardening – Structural changes of steel – Lower, upper critical temperatures (LCT, UCT).

Unit III: Mass, Weight, Volume, Density, Speed, Velocity and Work Power Energy (20 Questions)

Mass, Volume, Density, Weight and Specific gravity – Related problems – Speed, Velocity - Rest, Motion, acceleration and retardation - Related problems

Work – Power – Energy - Horse Power (HP), Indicated Horse Power (IHP), Brake Horse Power (BHP) and efficiency - Potential energy - kinetic energy and related problems.

Unit IV: Heat and Temperature (20 Questions)

Heat and temperature – concept - effects - difference - Boiling point & melting point of different metals and non-metals – Measuring Instruments – Thermometer – Pyrometer – Transmission of heat – Conduction – Convection – Radiation – Co-efficient of Linear expansion and related problems –Heat loss and heat gain - Thermal conductivity and insulators - Concept of pressure - Units of pressure, atmospheric pressure, absolute pressure, gauge pressure and gauges used

Unit V: Basic Electricity (15 Questions)

Uses of electricity - electric current - alternating current - direct current - comparison – voltage - resistance - units - conductor - insulator, types of connections - series and parallel - Ohm's law - related problems - magnetic induction - self and mutual inductance - Electro Motive Force (EMF), electrical Power, Horse Power, energy - units of electrical energy

Unit VI: Mensuration – Area of Cut-Out Regular and Irregular Surfaces (20 Questions)

Area and perimeter of square - rectangle - parallelogram - triangles - circle - semi-circle - circular ring - sector of circle - hexagon and ellipse

Lateral surface area (LSA), total surface area (TSA) and volume of solids – cube – cuboid – cylinder - sphere and hollow cylinder - capacity in litres of hexagonal, conical and cylindrical shaped vessels – related problems.

Area of cut out regular surfaces – circle - segment - sector of circle - related problems - area of irregular surfaces and application related to shop problems

Unit VII: Friction (15 Questions)

Friction - Advantages and disadvantages - Laws of friction – co-efficient of friction - angle of friction - simple problems related to friction - application and effects of friction in workshop practice - lubrication.

Unit VIII: Centre of Gravity, Levers and Simple Machines and Elasticity (20 Questions)

Centre of gravity - Centre of gravity and its practical application - Simple machines - Effort and load - mechanical advantage - velocity ratio - efficiency of machine - relationship between efficiency - velocity ratio and mechanical advantage - Elasticity - Elastic, plastic materials – stress - strain and their units - young’s modulus of elasticity - Ultimate stress - working stress – stress – strain curve.

Unit IX: Algebra & Trigonometry (20 Questions)

Algebra – addition – subtraction - multiplication - division - Theory of indices - algebraic formulae - related problems - Measurement of angles - Trigonometrical ratios – workshop related height and distance calculation.

Unit X: Estimation and Costing, Profit and Loss (20 Questions)

Estimation and costing - Simple estimation - requirement of material estimation and costing - Problems on estimation and costing.

Profit and loss - Simple problems in Profit and loss - Simple interest - compound interest.

Annexure IV

Instructions to be followed by the candidates

1. Written Examination

1.1. Reporting Time at the Examination Venue

1.1.1. To facilitate verification of the identity of the candidates and explanation of the procedures related to the examination, the candidates shall present themselves at the examination venue one hour before the time scheduled for the commencement of the examination.

1.1.2. All gates serving as entry into the examination venue shall be closed thirty minutes before the commencement of the examination. After that, no candidate shall be permitted to enter the premises of the examination venue.

1.1.3. In case of examinations to be held in both forenoon and afternoon sessions, the reporting time for the afternoon session shall also be thirty minutes before the commencement of the examination and no one shall be allowed into the venue thereafter.

1.2. Entry into the Examination Venue

1.2.1. Candidates shall present themselves at the examination venue with the memorandum of admission (hall ticket) downloaded from the Commission‘s website, failing which, they shall not be allowed to write the examination. Candidates shall also bring with them, a photocopy of their Aadhaar card / Passport / Driving Licence / Permanent Account Number (PAN) card / Voter ID card as identity proof.

1.2.2. Candidates must appear for the examination at the venue they have been allotted, as mentioned in the memorandum of admission (hall ticket). Change of venue will not be permitted. No candidate, without prior approval, shall be allowed to appear for the examination at a venue other than the one originally allotted.

1.2.3. Candidates may be subjected to frisking at the examination venue, if required, with the assistance of male/female police personnel or any authorized persons, as the case may be.

1.2.4. Parents and others who accompany the candidates will not be permitted inside the examination venue.

1.3. Memorandum of Admission (Hall Ticket)

1.3.1. If the photograph of the candidate in the memorandum of admission is not printed or not clear or does not match with candidate‘s appearance, he/she should furnish a separate photograph affixed on a plain paper, along with his name, address, register number and signature along with a copy of the memorandum of admission (hall ticket) and a copy of Aadhaar card / Passport / Driving Licence / Permanent Account Number (PAN) card / Voter ID card, to the Chief Invigilator, who shall countersign it. The identity proof in original, should also be shown to the room invigilator for verification. The room invigilator upon verification of the identity of the candidate, shall obtain an undertaking as to the genuineness of the candidate and to the effect that he / she is aware that he / she is liable to any criminal / penal action initiated by the Commission, if the information furnished is found to be incorrect at a later date. The undertaking shall then be handed over to the Chief Invigilator.

1.3.2. Candidates must show the memorandum of admission to the Invigilator / Chief Invigilator / inspection authorities / any authorized persons of the examination hall, on demand for verification.

1.3.3. The memorandum of admission should be preserved carefully and retained permanently. The memorandum of admission should be produced if shortlisted for the next stage of selection / whenever sought by the Commission. The memorandum of admission may also be photocopied, as a precaution, after the examination is over. No duplicate memorandum of admission will be issued later.

1.4. Examination Room

1.4.1. The candidates shall compulsorily be seated in the examination room thirty minutes before the time scheduled for the commencement of the examination.

1.4.2. Water, tea, coffee, snacks, soft drinks, etc., will not be allowed inside the examination room.

1.4.3. Candidates should maintain strict discipline not only in the examination room but also inside the campus of the examination venue. Candidates found smoking / intoxicated or found to have entered into a quarrel of any kind, or to have misbehaved with the Chief Invigilator or with the inspection authorities or with the invigilator or with any other candidate either in the examination hall or inside the campus of the examination venue, either before, during or after the examination, are liable to invalidation of answer sheet and debarment for any period the Commission may deem fit, as well as appropriate criminal action.

1.4.4. Candidates suffering from serious health issues, may, with the consent of the Chief Invigilator, deposit medication or other medical requirements on the room invigilator‘s table for use if needed.

1.4.5. In case of extraordinary circumstances, like pandemic conditions, etc., the procedures / precautions prescribed (e.g., use of sanitizer and face mask, practicing social distancing) shall be adhered to.

1.5. Alarm Bell

An alarm bell shall be sounded in respect of each of the following activities to alert the candidates. The room invigilators shall make appropriate announcements as and when required.

Event	**Timeline**	**Duration of Bell**
Before Commencement of Examination		
Objective type Examination: Distribution of OMR answer sheets	30 minutes before	Short Bell (2 seconds)
At the Start and During the Examination		
Commencement of the Examination	At the Designated Time	Long Bell (5 seconds)
During the Examination	Every One Hour	Short Bell (2 seconds)
Before Conclusion of the Examination	10 minutes before conclusion	Short Bell (2 seconds)
At the Conclusion of the Examination		
Conclusion of the Examination	At the Designated Time	Long Bell (5 seconds)

1.6. Instructions for the Objective Type Examination (OMR)

1.6.1. Candidates must carry only black ink ball point pen, a photocopy of any one proof of ID, as specified and memorandum of admission (hall ticket) inside the examination room. Other materials are not allowed.

1.6.2. OMR Answer Sheet

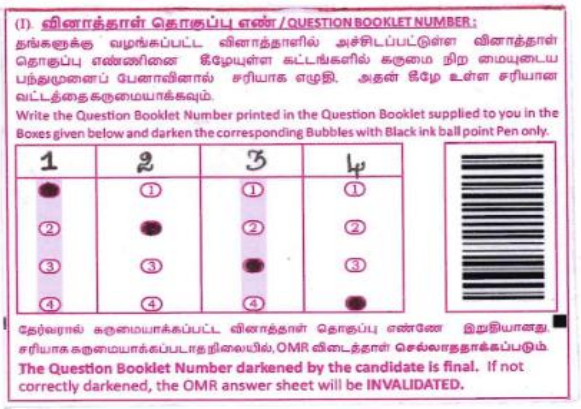
1.6.2.1. The pre-printed personalized OMR answer sheets containing photograph, name, register number,

subject, examination centre and venue, date and session as mentioned in the memorandum of admission (hall ticket) will be distributed thirty minutes before the time scheduled for the commencement of the objective type examination.

1.6.2.2. Before using the OMR answer sheet, the photograph and the details printed on it shall be verified by the candidates. It shall be ensured that the OMR answer sheet pertains to the candidate only. If any of the details are found to be incorrect or defective in any way, it should be immediately reported to the room invigilator for replacement. No OMR answer sheet will be replaced after use.

1.6.2.3. Candidates shall darken the question booklet number and answers in the OMR answer sheet, as per the correct method specified below;

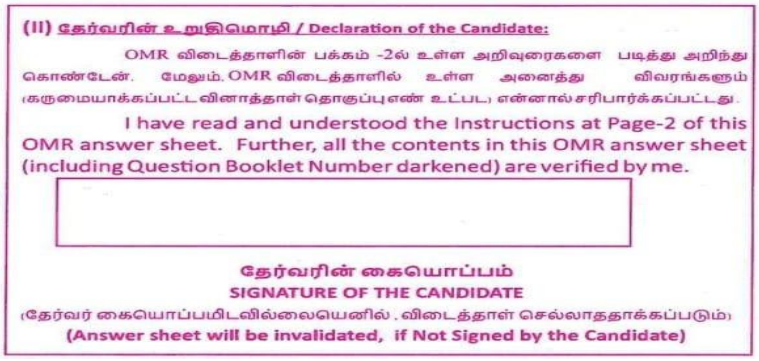
1.6.2.4. The candidate must write and darken the Question Booklet Number which is used by him / her correctly in the bubbles provided in the OMR answer sheet. The question booklet number darkened by the candidate is final. The OMR answer sheets will be evaluated based on the Question Booklet Number darkened by the candidates in the bubbles. The correct method of darkening Question Booklet Number is illustrated below. For example, if the Question Booklet Number is 1234



1.6.2.5. Candidates must darken only one of the answer bubbles in the OMR answer sheet, for each question. In case more than one bubble is darkened for a particular question, that answer shall not be evaluated.

1.6.2.6. Candidates should darken in the respective answer bubble for all the 200 questions. Option [E] should be darkened if the answer is not known to the candidate. If the candidates darkened the respective answer bubble for all 200 questions, they should darken the circle “Yes”. If not darkened the respective answer bubble for one or more questions i.e., left blank, they should darken the circle “No”. The candidates should write the total number of questions not darkened in the specified box, as below;

1.6.2.7. Candidates shall affix their signature at the designated place in the OMR answer sheet.


(II) தேர்வரின் உறுதிமொழி / Declaration of the Candidate:

OMR விடைத்தாளின் பக்கம் -2ல் உள்ள அறிவுரைகளை படித்து அறிந்து கொண்டேன். மேலும், OMR விடைத்தாளில் உள்ள அனைத்து விவரங்களும் (கருமையாக்கப்பட்டவினாத்தாள் தொகுப்புஎண் உட்பட) என்னால்சரிபார்க்கப்பட்டது.

I have read and understood the Instructions at Page-2 of this OMR answer sheet. Further, all the contents in this OMR answer sheet (including Question Booklet Number darkened) are verified by me.

தேர்வரின் கையொப்பம்
SIGNATURE OF THE CANDIDATE
(தேர்வர் கையொப்பமிடவில்லையெனில், விடைத்தாள் செல்லாததாக்கப்படும்)
(Answer sheet will be invalidated, if Not Signed by the Candidate)

1.6.2.8. Candidates shall affix his / her left hand thumb impression at the designated place in the OMR answer sheet.


இடது கை பெருவிரல் ரேகை பதியவில்லையெனில் தேர்வர் பெறும் மொத்தமதிப்பெண்களிலிருந்து 0.5 மதிப்பெண் குறைக்கப்படும்.
0.5 mark will be deducted from total marks obtained by the candidate for not affixing Left Hand Thumb Impression.
(V) தேர்வரின் இடதுகை பெருவிரல் ரேகை மட்டும்.
Candidate's Left Hand Thumb Impression only.

1.6.2.9. The room invigilator should darken the respective bubble in Column IA with black ink ball point pen, for the following details;

(I A) TO BE DARKENED BY THE INVIGILATOR (with Black ink Ballpoint pen)		
(a) Candidate's signature available in the space provided	YES ○	NO ○
(b) Candidate's Left Hand Thumb Impression available in the space provided	YES ○	NO ○

1.6.3. Question Booklet

1.6.3.1. The question booklet will be distributed fifteen minutes before the time scheduled for the commencement of the examination.

1.6.3.2. Before writing and darkening the Question Booklet Number in the OMR answer sheet, the candidate shall verify whether all the questions are printed without any omission. In case any defect is found, it shall immediately be reported to the Room Invigilator and a replacement shall be obtained which is complete in all aspects. If any defect is noticed in the question booklet after the commencement of the examination, it will not be replaced.

1.6.3.3. Candidates must not tick mark / mark the answers in the question booklet. Failure to comply with this instruction will result in rejection of candidature.

1.6.4. Attendance Sheet: After checking the OMR answer sheet and the question booklet for discrepancies, candidates must sign in the attendance sheet, after verifying his / her name and register number therein, duly mentioning the question booklet number.

1.6.5. The video regarding the instructions to candidates appearing for the objective type examination is available in https://tnpsc.gov.in/English/omr-guidelines.html.

1.7. **Computer Based Test (CBT) Examination**

1.7.1. The Registration for the examination shall start one hour before the time scheduled for the commencement of the examination.

1.7.2. Each candidate will be assigned a Computer to take up the examination.

1.7.3. No computer knowledge is required to take up the Computer Based Test. Knowledge in Mouse operation would suffice to take up the Computer Based Test.

1.7.4. Candidates will be provided with a user name and password to login the system.

1.7.5. Use the keyboard only to key–in the Register Number, User id (registration id) and password.

1.7.6. Necessary instructions will be displayed on the screen. Kindly read all the instructions carefully and follow the instructions without fail.

1.7.7. Questions with five options each will be displayed in the computer screen.

1.7.8. One question will be displayed on the screen at a time.

1.7.9. The questions will appear on the screen in ascending order, which can be answered one by one.

1.7.10. Candidate can use only the mouse to select the correct answers and proceed with answering the questions.

1.7.11. To select your answer of a question, click on the button of one of the options.

1.7.12. Click on Save and Next button after answering every question to save your answer. Otherwise your answer will not be saved.

1.7.13. To deselect your chosen answer, click on the button of the chosen option again or click on the Clear Response button.

1.7.14. Candidates can proceed to the next question by clicking next button or previous question by clicking previous button.

1.7.15. Candidates can recheck his / her answers and if he / she feels to correct the answers, it can be done at any time before the closure of examination. They can skip the questions also, if they desire so.

1.7.16. Candidate can submit their answers at any time during the examination.

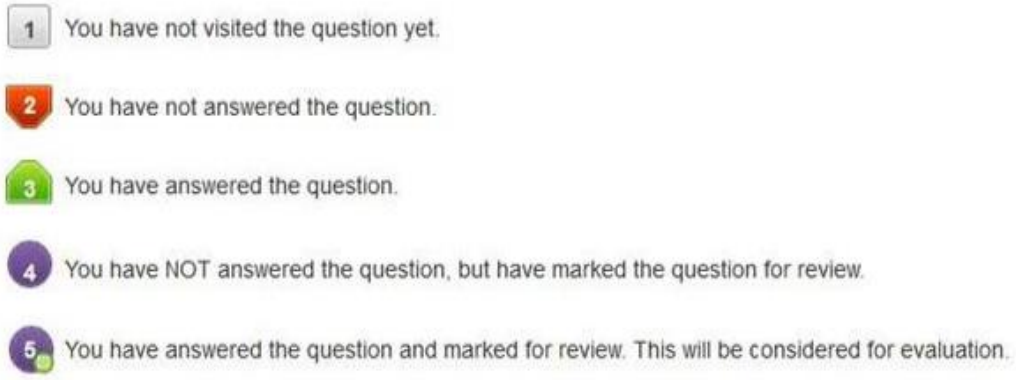
1.7.17. Once the entire answers are submitted, the candidates have no option to proceed further.

1.7.18. If the candidates fail to submit their answers, the system will automatically submit the answers to the server, at the closure of the examination.

1.7.19. The question and answers can be zoomed to the required level for the candidates with visual impairment.

1.7.20. Instruction for enlarging images, to view the image provided in the question in a bigger size, click on the image and rotate the scrolling wheel on the mouse.

1.7.21. Question Number Box: Question Number Box displayed on the right side of the screen will show the status of each question using one of the following symbols:



The ‘Marked for Review’ status for a question simply indicates that you would like to look at that question again.

You can click on the ">" arrow which appears to the left of question number box to minimize the question number box. This will enable you to view the question on a bigger area of the screen. To view the question number box again, you can click on "<" arrow which appears on the right side of the screen.

You can click on to navigate to the bottom and to navigate to the top of the question area, without scrolling. The summary of number of questions answered, not answered, not visited, marked for review and answered and marked for review will be displayed above the question number box.

1.7.22. Time available for the candidate to complete the examination will be displayed through a countdown timer in the top right-hand corner of the screen. It will display the remaining time as Time Left. (For example: if duration of examination is 3 hours, at the beginning of exam, timer will show 180 minutes and for Differently Abled candidates with scribe / without scribe 240 minutes, which will reduce gradually with passage of time). When the timer reaches zero, the examination will end by itself and the examination will be submitted by the system automatically.

1.7.23. Candidates will be provided with a paper for doing rough work. After closure of the examination, rough sheet will be collected.

1.7.24. Candidates have to sign the attendance sheet and affix thumb impression for verification of his / her identity.

1.7.25. The Examination Hall will be under camera surveillance.

1.7.26. Any attempt of malpractice found, will render you liable to such penal action as the Commission may decide.

1.7.27. In case of doubt in the questions and answers, English version is the final.

1.7.28. To acquaint with the operation of Mouse and the CBT, the candidates can take up the mock test available in the Commission's website (www.tnpsc.gov.in) and they can practice the usage of mouse in the mock test. Mock test is similar to the CBT to be held on the day of examination. In the Mock test, all the steps are given similar to the CBT. Candidates can practice the mock test as many times as he / she likes.

1.8. Other Instructions for the Written Examination

1.8.1. No candidate will be allowed to leave the examination hall until the closure of the examination.

1.8.2. The candidates are instructed to cooperate with the videographer and display clear visuals of his/her face and Register Number either on table or through Hall Ticket as and when the videographer comes to the table for taking visuals.

1.8.3. Requests from candidates for furnishing of their marks or answer paper copy before the completion of the entire selection process, will not be entertained by the Commission.

1.8.4. After conclusion of the entire selection process, copies of OMR answer sheet shall be made available to the candidates on the Commission's website. On requisite payment, the candidates can download the answer papers.

1.9. Instructions for Usage of scribe and Compensatory Time

1.9.1. Candidates with Disability

1.9.1.1. Candidates with disability, shall be permitted to utilize the services of a scribe upon making such request in the online application subject to the following conditions. Request for scribe made after the submission of application or on the date of examination will receive no attention.

1.9.1.2. For the candidate with disability as defined under section 2(s) of the Rights of Persons with Disability Act, 2016, the facility of scribe and/or compensatory time shall be granted solely to those having difficulty in writing subject to uploading of a certificate to the effect that person concerned has limitation to write, including that of speed and that scribe is essential to write examination on his / her behalf from the Medical Board as per the format available in Annexure II . Compensatory time of not less than 20 minutes per hour of examination will be allowed to candidates with disability, who have physical limitation to write including that of speed and who are utilizing the services of a scribe. The candidate with disability should upload the Certificate of Disability in the format prescribed in Annexure II and the Certificate from the Medical Board in the format available in Annexure VI at the time of submission of online application.

1.9.2. Candidates with Benchmark Disability

1.9.2.1. Candidates with benchmark disability, shall be permitted to utilize the services of a scribe / compensatory time upon making such request in the online application subject to the following conditions. Request for scribe / compensatory time made after the submission of application or on the date of examination will receive no attention.

1.9.2.2. Candidate with benchmark disability as defined under section 2(r) of the Rights of Persons with Disability Act, 2016, in the category of blindness, locomotor disability (both arm affected) and cerebral palsy, the facility of scribe shall be given, if so desired by the candidate. Compensatory time of not less than 20 minutes per hour of examination will be allowed to candidates with blindness, locomotor disability (both arm affected) and cerebral palsy and who are utilizing the services of a scribe. The candidates with benchmark disability in the category of blindness, locomotor disability (both arm affected) and cerebral

palsy should upload the Certificate of Disability in the format prescribed in Annexure II, at the time of submission of online application.

1.9.2.3. In case of other category of benchmark disability, the provision of scribe can be allowed on uploading of a certificate from the Chief Medical Officer / Civil Surgeon / Medical Superintendent of a Government Health care institution, to the effect that person concerned has limitation to write, including that of speed and that scribe is essential to write examination on his/her behalf. Compensatory time of not less than 20 minutes per hour of examination will be allowed to candidates with other category of benchmark disability and who are utilizing the services of a scribe. The format of the certificate is available in Annexure II. The candidates with other category of benchmark disability should upload the Certificate of Disability in the format prescribed in Annexure II and the Certificate from the Chief Medical Officer / Civil Surgeon / Medical Superintendent of a Government Health care institution in the format available in the Annexure VI, at the time of submission of online application.

1.9.2.4. All candidates with benchmark disability who have physical limitation with regard to writing including that of speed and not availing the services of a scribe will be allowed additional time of a minimum of one hour for an examination of three hours duration, on production of a certificate from the Chief Medical Officer / Civil Surgeon / Medical Superintendent of a Government Health care institution, to the effect that person concerned has limitation to write and compensatory time is recommended. Such candidates with benchmark disability should upload the Certificate of Disability in the format prescribed in Annexure II and the Certificate from the Chief Medical Officer / Civil Surgeon / Medical Superintendent of a Government Health care institution in the format available in Annexure VI at the time of submission of online application.

1.9.3. The Commission will arrange for scribes and the fee amount to be paid to the scribes will be met by the Commission. Candidates availing of the services of the scribes need not pay any fee to them.

1.9.4. All candidates with disability, availing of the services of the scribes while appearing for the written examination will be seated in a separate room in the ground floor, in close vicinity to the Chief Invigilator‘s control room and under the close supervision of the Chief Invigilator.

1.10. Special Instructions for the Candidates with Benchmark Disabilities

1.10.1. Candidates with benchmark disability must affix their signature and left hand thumb impression in the space provided in the answer sheets, if possible. Candidates with locomotor disability and visual impairment who have been permitted to use scribe facility, who are unable to affix their signature, may affix their left hand thumb impression alone. Candidates who are unable to use their left hand, must affix right hand thumb impression. Candidates who are unable to use both hands, and who have been permitted to use scribe, may leave the signature and thumb impression columns blank.

1.10.2. All persons with benchmark disability, who are unable to climb the staircase, will be allowed to write the examination in a room in the ground floor, in close vicinity to the Chief Invigilator’s control room.

1.11. Penalty for Violation of Commission’s Instructions

The answer sheets of the candidate will be invalidated / marks deducted / criminal action initiated / and debarment imposed for the following violations:

1.11.1. Invalidation of Answer Sheet in Objective Type Examination

1.11.1.1. Usage of pen other than black ink ball point pen.

1.11.1.2. Making any irrelevant or impertinent remarks / symbols.

1.11.1.3. If the candidate has not signed in the space provided at page 1 of the OMR answer sheet.

1.11.1.4. If the Question Booklet Number printed in the Question Booklet supplied to the candidate is not darkened correctly in the OMR answer sheet / or even if one or more bubble(s) of Question Booklet Number is left blank (not darkened) in the OMR answer sheet.

1.11.2. Deduction of Marks for Objective Type Examination

1.11.2.1. If none of the respective answer bubble is darkened for any of the question, (i.e., if left blank) 0.5 mark will be deducted from the total marks obtained by the candidate.

1.11.2.2. If Left Hand Thumb Impression is not affixed at the space provided at page 1 of the OMR answer sheet, 0.5 mark will be deducted from the total marks obtained by the candidate.

1.11.3. Criminal Action: Criminal action will be initiated against the candidates for the following reasons.

1.11.3.1. Misbehaviour and indiscipline in the examination hall: Candidates should maintain strict discipline not only in the examination room, but also inside the campus of the examination venue. Candidates found smoking / intoxicated, or found to have entered into a quarrel of any kind, or to have misbehaved with the Chief Invigilator or with the inspection authorities or with the invigilator or with any other candidate either in the examination hall or inside the campus of the examination venue, either before, during or after the examination, are liable to invalidation of Answer sheet and debarment for any period the Commission may deem fit, as well as appropriate criminal action.

1.11.3.2. Indulging in any type of malpractice, including impersonation and resorting to unfair means within the examination hall or outside will lead to debarment for any period deemed fit by the Commission, besides initiation of criminal action.

1.11.3.3. Invalidation of answer sheet as well as debarment for such period as the Commission may deem fit will be imposed on candidates resorting to any kind of irregularity or malpractice within / outside the examination hall including:

a. Consulting with / copying from another candidate in the examination hall.
b. Permitting others to copy from his / her OMR answer sheet.
c. Copying from books or notes which are printed / type written / hand written.
d. Seeking the help / assistance of any official / hall supervisor in answering questions in examination hall.
e. Approaching or attempting to approach an examiner or getting other people to approach an examiner on his behalf.
f. Possession of electronic devices such as cellular phones, watches with inbuilt memory notes, rings with in-built memory notes, Bluetooth devices, communication chip, other electronic devices and non-electronic devices such as P&G design data book, books, notes, handbags, other non-permitted materials, etc.
g. Taking away from the examination hall, the whole or part of any used / unused OMR answer sheet without handing it over to the room invigilator.
h. Tampering with the Barcode printed on the OMR answer sheet.

1.11.3.4. Violation of any one or more of the instructions contained in the Commission‘s Instructions to Applicants, instructions mentioned in the Notification, instructions printed on the memorandum of admission (hall ticket) shall also make the candidate liable to debarment, either permanently or for such

period as the Commission deems fit, and/or rejection of candidature after due process and /or any other penalty, as decided by the Commission.

1.11.4. Debarment

The period for which candidates shall be debarred from appearing for the examinations / participating in the recruitment processes conducted by the Commission, for the offences committed by the candidates are given below. Besides debarment, the candidate shall also be liable to rejection of candidature after due process, invalidation of answer sheet, as the case may be. Criminal action may also be initiated against such candidates wherever indicated.

S. No	Nature of Offence	Period of Debarment
1	Attempts to influence the Chairman, Members of the Commission, Secretary, Controller of Examinations or any officer or staff of the Commission, personally / by letter / through relatives, friends, patrons, officials or other persons.	Three Years
2	Production of bogus community / destitute widow / differently abled / ex-serviceman / transgender / person studied in Tamil medium certificates, etc. Tampering or alteration in the documents or certificates.	Permanent, Initiation of criminal action
3	Suppression of material information, at any stage of the selection process, regarding: (i) Previous appearances or availing free chances. (ii) Regular / temporary employment in Government or Quasi-Government organizations, local bodies, public sector undertakings, statutory bodies, public corporations, Universities, etc., (iii) Criminal cases, arrests, convictions, disciplinary proceedings, etc. (iv) Debarment or disqualification by Union Public Service Commission / State Public Service Commissions / other agencies	One Year
4	Possession of electronic devices such as cellular phones, watches and rings with in-built memory notes, Bluetooth devices, communication chip, any other electronic devices inside the examination room and also seeking the help of / assistance of any official / invigilator / any outsider in answering question	Permanent
5	Possession of non-electronic devices such as P&G Design Data Book, books, notes, guides, handbags, other non-permitted materials, etc. inside the examination room.	Three Years
6	Consulting with other candidates, copying from other candidates, permitting others to copy from his / her answer paper, copying from books or notes which are printed / typewritten / hand written, etc.	Three Years
7	In addition to the offences listed herein, the involvement of candidates in any indiscipline or irregular practices within / outside the examination room.	Three Years
8	Written certain unwarranted remarks unconnected with answers to the subject concerned in the answer books, etc., i.e., vulgar, derogatory and obscene language.	Three Years
9	Taking away from the examination hall, the whole or part of any used / unused OMR answer sheet, without handing it over to the room invigilator. Tampering with the Barcode.	Three Years

10	Candidates found smoking / intoxicated, or found to have entered into a quarrel of any kind, or to have misbehaved with the Chief Invigilator or with the inspection authorities or with the invigilator or with any other candidate either in the examination hall or inside the campus of the examination venue, either before, during or after the examination.	Three Years
11	Indulging in grave malpractices, including impersonation, amounting to subversion of the conduct of examination.	Permanent, Initiation of criminal action

2. Answer Key Challenge for Objective Type Examination

2.1. Tentative answer keys will be hosted in the Commission's website within fifteen working days from the date of conduct of examination. Instructions available in the Para 17 D (iv) of Instructions to Applicants are not applicable to this recruitment. Candidates can challenge the tentative answer keys through the 'Answer Key Challenge' window available in the Commission's website (www.tnpsc.gov.in) [Recruitment → Answer Keys]. Representations, if any, challenging the tentative answer keys shall be submitted only through online mode within seven days from the date of publication of tentative answer keys. Representations received by post or e-mail will receive no attention.

2.2. Detailed instructions, procedures to challenge the tentative answer keys have been made available in the Commission's website. Representations made online/offline after the closure of the window will also receive no attention.

2.3. The challenges submitted on time, through the online mode, shall be referred to a committee comprising of experts in each subject. The decision on the final answer key shall be made, based on the recommendations of the expert committee and answer sheet evaluation shall commence thereafter.

2.4. The Commission shall not publish the final answer key until the completion of the entire selection process.

3. Onscreen Certificate Verification

3.1. Onscreen Certificate Verification will be done based on the documents already uploaded by the candidate at the time of online application.

3.2. Based on the onscreen certificate verification, the candidates will be given 10 calendar days to upload the required document(s) / defective document(s) or certificate(s). Failure to re-upload the required document(s) / defective document(s) or certificate(s) as per the claim in the online application within the time stipulated by the Commission, shall result in rejection of claim.

4. Physical Certificate Verification

4.1. Candidates admitted to physical certificate verification shall produce all the original certificates uploaded / re-uploaded (if applicable) for physical certificate verification as claimed in the online application, without fail.

4.2. After verification of original certificates, the eligible candidates alone will be admitted for counselling. If the candidate does not satisfy the eligibility criteria, his/her online application will be rejected and his/her provisional admission to physical certificate verification will be cancelled and will not be allowed to attend the counselling.

4.3. If the candidate does not appear for the physical certificate verification on the scheduled date and time, the candidate will not be given any further chance to appear for the physical certificate verification and will not be allowed to attend the counselling.

5. Counselling

5.1. Candidates will be allowed to participate in the counselling based on his / her rank. If the candidate does not appear for the counselling on the scheduled date and time, the candidate will not be given any further chance to appear for the counselling.

5.2. The post chosen by the candidate during the counselling cannot be changed under any circumstances.

Annexure V

1. Experience Certificate for the post of Chemist, Grade I in Industries and Commerce Department (Post Code: 3679)

1.	Name of the Employee	
2.	Father / Spouse Name	
3.	Date of Birth	
4.	Qualification possessed by the Employee on the date of joining service	
5.	Designation of the Employee	
6.	Nature of the Work / Duty performed by the Employee (To be mentioned in brief)	
7.	Period of Research Experience in Pure or Applied Chemistry or Analytical Chemistry	From _____ (date) To _____ (date) (YY/MM/DD)
8.	Total Research Experience in Pure or Applied Chemistry or Analytical Chemistry	____ years ____ months ____ days
9.	Whether Attendance Register / Attendance Rolls / Pay Register and other records available for this Employee	Yes / No
10.	Name of the Organisation / Institution	
11.	Address of the Organisation / Institution	
12.	Phone No. and Email ID of the Organisation / Institution	

This is to certify that Thiru / Tmt. / Selvi …… possesses the **experience in research in Pure or Applied Chemistry or Analytical Chemistry** as stated above, as on the date of notification (i.e., 13.06.2025). The above particulars furnished by me are correct.

Affix photograph of the employee with the signature of the Certifying Authority on the Photograph

Signature
Name & Designation of the Head of Organisation / Institution / Competent Authority

Place: Seal of Office / Officer

Date:

Note:

1. A certificate in the format prescribed should be obtained from the Head of the Institution where in the individual had served or the authority competent to issue such certificate.
2. The Competent authority who issues the certificate is cautioned that issuing of certificate which contains false or incorrect details will lead to legal / penal action against them.

2. Experience Certificate for the post of Hostel Superintendent cum Physical Training Officer in Employment and Training (Post Code: 1731)

1.	Name of the Employee	
2.	Father / Spouse Name	
3.	Date of Birth	
4.	Qualification possessed by the Employee on the date of joining service	
5.	Designation of the Employee	
6.	Nature of the Work / Duty performed by the Employee (To be mentioned in brief)	
7.	Whether the employee possesses teaching experience in the field of Physical Education	Yes / No
8.	Period of Teaching Experience in Physical Education	From _____ (date) To _____ (date)
9.	Total Experience (YY/MM/DD)	____ years ____ months ____ days
10.	Whether Attendance Register / Attendance Rolls / Pay Register and other records available for this Employee	Yes / No
11.	Name of the Institution	
12.	Type of Institution	
13.	Address of the Institution	
14.	Phone No. and Email ID of the Institution	

This is to certify that Thiru / Tmt. / Selvi …… possesses **teaching experience in Physical Education** as stated above, as on the date of notification (i.e., 13.06.2025). The above particulars furnished by me are correct.

Affix photograph of the employee with the signature of the Certifying Authority on the Photograph

Signature
Name & Designation of the Head of Organisation / Institution / Competent Authority

Place: Seal of Office / Officer

Date:

Note:

1. The Institution may be any Educational Institution.
2. A certificate in the format prescribed should be obtained from the Head of Institution wherein the individual had served or the authority competent to issue such certificate.
3. The competent authority who issues the certificate is cautioned that issuing of certificate which contains false or incorrect details will lead to legal / penal action against them.

Annexure VI

1. Form for Certificate for Allocation of Scribe / Compensatory Time

This is to certify that I have examined Mr/Ms/Mrs. _____(Name of the candidate with disability) a person with _____(Nature and percentage of disability as mentioned in the certificate of disability), S/o/D/o_____ a resident of_____ (Village / District / State and to state that He / She has physical limitation which hampers his / her writing capabilities owning to his / her disability.

Due to the above mentioned disability following concession may be given:- *

1. Allocation of a scribe.
2. Compensatory time for writing the examination.

*strike out the non applicable.

Signature
(Name of Government Hospital / Civil Surgeon / Medical Superintendent / Signature of the notified Medical Authority of a Government Health Care Institution / Medical Board)

Name & Designation

Name of Government Hospital / Health Care Centre / The notified Medical Authority/ Medical Board

Place:
Date:

(Photo of the Differently Abled Person and Stamp to be fixed here)

Signature / Thumb impression
of the Differently Abled Person

Note:
Certificate should be given by a specialist of the relevant stream / disability
(e.g. Visual Impairment – Ophthalmologist, Locomotor disability – Orthopedic Specialist / PMR etc.,)

2. Form for Eye Fitness Certificate

1. Name of the candidate		
2. Father's Name		
3. Visual standard without glasses	Right Eye	Left Eye
a. Distant Vision (without glasses)		
b. Near Vision (without glasses)		
4. Field Vision		
5. Colour Vision		
6. Fundus appearance		
7. Whether suffering from colour blindness? (Yes / No)		
8. Whether suffering from night blindness? (Yes / No)		
9. Standard Vision		

Date:	Signature of the Specialist in Ophthalmology: Name: Designation: Seal:

Note: Colour blindness is a disqualification for the posts of Junior Engineer (Post Code: 3662), Assistant Agricultural Officer (Post Code: 3101) and Assistant Horticultural Officer (Post Code: 3104)

Colour blindness / Night blindness is a disqualification for the posts of Chemist, Grade-I (Post Code: 3679), Overseer / Junior Draughting Officer in Rural Development and Panchayat Raj Department (Refer table in para No.3), Junior Technical Assistant (Post Code: 1853), Technical Assistant (Electrical) (Post Code: 3591)

3. Certificate from the Head of Institution / University

Photograph of the candidate with the signature of the authorised signatory

This is to certify that Thiru / Tmt / Selvi. _____ son / daughter of Thiru / Tmt._____ bearing Register no. _____, completed the _____ course during the academic year _____ to _____ in our Institution/University. He/ she has successfully completed all the requirements of the course/program and results for all subjects were declared on _____

Office Seal:

Date:

Signature (with Seal) of the
Authorised Signatory of the Institution / University
(Controller of Examinations / Principal / Dean / Registrar)

4. Form for Certificate of Physical Standards for the posts of Junior Tradesman in TNSTC

Name of the Candidate :

Father's Name :

Height : _____ cm

Weight : _____ kg

Signature of the Medical Officer

Name :

Designation :

Date : Seal :

Note: The certificate should be obtained from a Medical Officer above the rank of an Assistant Surgeon appointed by the Government to a Government Medical Institution

Annexure VII

S. No.	Post	Post Code	Department / Organization	Unit / District / State	Category	No.of Vacancies
1	Assistant Agricultural Officer	3101	Agriculture	State	GT (G)	3
					GT (G) (PSTM)	2
					GT (G) (LV/VI)	1
					GT (G) (EXSER)	1
					GT (W)	2
					BC(OBCM) (G)	3
					BC(OBCM) (G) (PSTM)	1
					BC(OBCM) (W)	1
					BC(OBCM)(W)(DW)	1
					BC(M) (W)	1
					MBC/DC (G)	1
					MBC/DC (G) (PSTM)	1
					MBC/DC (G) (LD/CP/LC/DF/AC/MuD)	1
					MBC/DC (G) (EXSER)	1
					MBC/DC (W)	1
					SC(A) (G) (EXSER)	1
					SC (G)	2
					SC (W)	1
					ST (G) (PSTM)	1
					Total	26
2	Assistant Horticultural Officer	3104	Horticulture	State	BL_GT (G) (HH)	1
					BL_BC(OBCM) (G)(HH)	1
					BL_BC(OBCM) (G) (ASD/SLD/MI)	1
					BL_BC(M) (G)	15
					BL_MBC/DC (G) (LD/CP/LC/DF/AC/MuD)	1
					BL_MBC/DC (G) (ASD/SLD/MI)	1
					BL_SC (G) (LV)	1
					GT (G)	3
					GT (G) (PSTM)	1
					GT (W) (PSTM)	1
					BC(OBCM) (G)	1
					BC(OBCM) (G) (PSTM)	1
					BC(OBCM) (G) (LV)	1
					BC(OBCM) (W)	1
					MBC/DC (G)	2
					MBC/DC (W)	1
					SC (G)	2
					SC (DW)	1
					SF_SC (G)	14
					Total	50

3	Assistant Manager (Mines)	3654	Tamil Nadu Magnesite Limited	State	GT (G)	1
					SC(A) (W) (PSTM)	1
					Total	2
4	Assistant Rubber Maker	3258	Arasu Rubber Corporation Limited	State	GT (G)	1
					Total	1
5	Chemist, Grade-I (Institute of Ceramic Technology, Viruthachalam)	3679	Industries and Commerce	State	GT (G)	1
					Total	1
6	Hostel Superintendent Cum Physical Training Officer	1731	Employment and Training (Training Wing)	State	BC(OBCM) (W)	1
					MBC/DC (G)	1
					Total	2
7	Junior Burner	3651	Tamil Nadu Magnesite Limited	State	GT (G)	1
					SC(A) (DW) (PSTM)	1
					Total	2
8	Junior Draughting Officer	3115	Highways	State	GT (G)	5
					GT (G) (PSTM)	2
					GT (G) (ASD/ID/SLD/MI/MD)	1
					GT (G) (EXSER)	1
					GT (W)	3
					GT (W) (PSTM)	1
					BC(OBCM) (G)	4
					BC(OBCM) (G) (PSTM)	2
					BC(OBCM) (G) (LV/VI)	1
					BC(OBCM) (W)	3
					BC(OBCM) (W) (PSTM)	1
					BC(M) (G)	1
					MBC/DC (G)	5
					MBC/DC (G) (PSTM)	1
					MBC/DC (W)	2
					SC(A) (G)	1
					SC(A) (G) (PSTM)	1
					SC (G)	4
					SC (W)	1
					SC (W) (PSTM)	1
					Total	41
9	Junior Draughting Officer	3547	Tamil Nadu Forest Plantation Corporation Limited	State	SC(A) (W) (PSTM)	1
					Total	1
10	Junior Engineer	3662	Archaeology	State	GT (G)	1
					GT (W)	1
					BC(OBCM) (G)	1

					MBC/DC (G)	1
					SC(A) (W) (PSTM)	1
					SC (G)	1
					Total	6
11	Junior Foreman (Factory)	3652	Tamil Nadu Magnesite Limited	State	GT (G)	1
					SC(A) (DW) (PSTM)	1
					Total	2
12	Junior Technical Assistant	1853	Textiles	State	BC(OBCM) (W)	1
					MBC/DC (W)	1
					SC (G)	1
					Total	3
13	Junior Tradesman - AC Mechanic	3661	Tamil Nadu State Transport Corporation-Salem	Salem	GT (G)	1
					MBC/DC (G)	1
					SC(A) (DW) (PSTM)	1
					Total	3
14	Junior Tradesman-Diesel Mechanic	3656	Tamil Nadu State Transport Corporation-Kumbakonam	Kumbakonam	SF_SC (G)	3
					SF_ST (G)	15
					Total	18
15	Junior Tradesman-Electrician	3688	State Express Transport Corporation Limited, Tamil Nadu	State	GT (G)	1
					GT (DW)	1
					BC(OBCM) (G)	1
					MBC/DC (G)	1
					SC(A) (DW) (PSTM)	1
					SF_SC (G)	4
					SF_ST (G)	12
					Total	21
16	Junior Tradesman-Electrician	3684	Tamil Nadu State Transport Corporation-Coimbatore	Coimbatore	SF_SC (G)	5
					SF_ST (G)	44
					Total	49
17	Junior Tradesman-Electrician	3683	Tamil Nadu State Transport Corporation-Kumbakonam	Kumbakonam	SF_SC (G)	6
					SF_ST (G)	34
					Total	40
18	Junior Tradesman-Electrician	3687	Tamil Nadu State Transport Corporation-Madurai	Madurai	SF_ST (G)	4
					Total	4
19	Junior Tradesman-Electrician	3686	Tamil Nadu State Transport Corporation-Salem	Salem	GT (G)	4
					GT (G) (PSTM)	1
					GT (G) (LV/VI)	1
					GT (W)	2
					GT (DW)	1
					BC(OBCM) (G)	4

					BC(OBCM) (G) (PSTM)	1
					BC(OBCM) (W)	1
					BC(OBCM) (DW)	1
					BC(M) (G)	1
					MBC/DC (G)	3
					MBC/DC (G) (PSTM)	1
					MBC/DC (W)	1
					MBC/DC (DW)	1
					SC(A) (DW) (PSTM)	1
					SC (G)	2
					SC (G) (PSTM)	1
					SC (W)	1
					SC (DW)	1
					SF_SC (G)	5
					SF_ST (G)	1
					Total	35
20	Junior Tradesman-Electrician	3685	Tamil Nadu State Transport Corporation-Tirunelveli	Tirunelveli	SF_SC (G)	4
					SF_ST (G)	21
					Total	25
21	Junior Tradesman-Fitter	3657	Tamil Nadu State Transport Corporation-Kumbakonam	Kumbakonam	SF_ST (G)	3
					Total	3
22	Junior Tradesman-Fitter	3700	Tamil Nadu State Transport Corporation-Salem	Salem	GT (G)	1
					MBC/DC (G)	1
					SC(A) (DW) (PSTM)	1
					SF_SC (G)	1
					Total	4
23	Junior Tradesman-Fitter	3699	Tamil Nadu State Transport Corporation-Tirunelveli	Tirunelveli	SF_SC (G)	2
					SF_ST (G)	18
					Total	20
24	Junior Tradesman-Mechanic Motor Vehicle	3655	Metropolitan Transport Corporation Limited, Chennai	Chennai	SF_SC (G)	3
					SF_ST (G)	37
					Total	40
25	Junior Tradesman-Mechanic Motor Vehicle	3694	State Express Transport Corporation Limited	State	GT (G)	2
					GT (DW)	1
					BC(OBCM) (G)	2
					BC(OBCM) (DW)	1
					MBC/DC (G)	1
					MBC/DC (DW)	1
					SC(A) (DW) (PSTM)	1
					SC (G)	1
					SF_SC (G)	5

					SF_ST (G)	28
					Total	43
26	Junior Tradesman-Mechanic Motor Vehicle	3690	Tamil Nadu State Transport Corporation-Coimbatore	Coimbatore	SF_SC (G)	6
					SF_ST (G)	49
					Total	55
27	Junior Tradesman-Mechanic Motor Vehicle	3689	Tamil Nadu State Transport Corporation-Kumbakonam	Kumbakonam	SF_SC (G)	3
					SF_ST (G)	15
					Total	18
28	Junior Tradesman-Mechanic Motor Vehicle	3693	Tamil Nadu State Transport Corporation-Madurai	Madurai	SF_SC (G)	1
					SF_ST (G)	28
					Total	29
29	Junior Tradesman-Mechanic Motor Vehicle	3692	Tamil Nadu State Transport Corporation-Salem	Salem	GT (G)	2
					GT (DW)	1
					BC(OBCM) (G)	1
					BC(OBCM) (DW)	1
					MBC/DC (G)	1
					MBC/DC (DW)	1
					SC(A) (DW) (PSTM)	1
					SC (G)	1
					SF_SC (G)	2
					Total	11
30	Junior Tradesman-Mechanic Motor Vehicle	3691	Tamil Nadu State Transport Corporation-Tirunelveli	Tirunelveli	SF_SC (G)	4
					SF_ST (G)	21
					Total	25
31	Junior Tradesman-Sheet Metal	3660	Tamil Nadu State Transport Corporation-Kumbakonam	Kumbakonam	SF_SC (G)	2
					SF_ST (G)	8
					Total	10
32	Junior Tradesman-Welder	3658	Metropolitan Transport Corporation Limited, Chennai	Chennai	SF_SC (G)	3
					SF_ST (G)	27
					Total	30
33	Junior Tradesman-Welder	3695	Tamil Nadu State Transport Corporation-Kumbakonam	Kumbakonam	SF_SC (G)	2
					SF_ST (G)	10
					Total	12
34	Junior Tradesman-Welder	3697	Tamil Nadu State Transport Corporation-Madurai	Madurai	SF_ST (G)	4
					Total	4

35	Junior Tradesman-Welder	3696	Tamil Nadu State Transport Corporation-Salem	Salem	GT (G)	2
					GT (G) (PSTM)	1
					GT (DW)	1
					BC(OBCM) (G)	2
					BC(OBCM) (G) (PSTM)	1
					BC(OBCM) (DW)	1
					BC(M) (G)	1
					MBC/DC (G)	2
					MBC/DC (DW)	1
					SC(A) (DW) (PSTM)	1
					SC (G)	2
					SC (DW)	1
					SF_SC (G)	2
					Total	18
36	Junior Training Officer (Manufacturing Process Control and Automation)	3636	Employment and Training (Training Wing)	State	GT (G)	6
					GT (G) (PSTM)	2
					GT (G) (LV/VI)	1
					GT (G) (EXSER)	1
					GT (W)	4
					GT (W) (PSTM)	1
					BC(OBCM) (G)	6
					BC(OBCM) (G) (PSTM)	2
					BC(OBCM) (G) (EXSER)	1
					BC(OBCM) (W)	3
					BC(OBCM) (W) (PSTM)	1
					BC(M) (G)	1
					BC(M) (W)	1
					MBC/DC (G)	4
					MBC/DC (G) (PSTM)	1
					MBC/DC (G) (LD/CP/LC/DF/AC/MuD)	1
					MBC/DC (G) (EXSER)	1
					MBC/DC (W)	3
					SC(A) (G) (PSTM)	1
					SC(A) (W) (PSTM)	1
					SC (G)	4
					SC (G) (PSTM)	1
					SC (W)	2
					Total	49
37	Junior Training Officer (Operator Advanced Machine Tool)	3638	Employment and Training (Training Wing)	State	GT (G)	1
					MBC/DC (G)	1
					SC(A) (W) (PSTM)	1
					Total	3

38	Junior Training Officer (Pump Operator cum Mechanic)	3639	Employment and Training (Training Wing)	State	GT (G)	1
					SC(A) (W) (PSTM)	1
					Total	2
39	Junior Training Officer (Refrigeration and Air Conditioner Technician)	3637	Employment and Training (Training Wing)	State	GT (G)	1
					GT (W)	1
					BC(OBCM) (G)	1
					BC(OBCM) (W)	1
					MBC/DC (G)	1
					MBC/DC (W)	1
					SC(A) (W) (PSTM)	1
					SC (G)	1
					Total	8
40	Junior Training Officer (Sewing Technology)	3640	Employment and Training (Training Wing)	State	GT (G)	1
					BC(OBCM) (G)	1
					MBC/DC (G)	1
					SC(A) (W) (PSTM)	1
					Total	4
41	Junior Training Officer (Smart Phone Technician cum App Tester)	3641	Employment and Training (Training Wing)	State	GT (G)	1
					SC(A) (W) (PSTM)	1
					Total	2
42	Junior Training Officer (Solar Technician (Electrical))	3642	Employment and Training (Training Wing)	State	GT (G)	1
					SC(A) (W) (PSTM)	1
					Total	2
43	Junior Training Officer (Surveyor)	3643	Employment and Training (Training Wing)	State	GT (G)	1
					GT (W)	1
					BC(OBCM) (G)	1
					MBC/DC (G)	1
					SC(A) (W) (PSTM)	1
					Total	5
44	Junior Training Officer (Technician Medical Electronics)	3644	Employment and Training (Training Wing)	State	GT (G)	1
					SC(A) (W) (PSTM)	1
					Total	2
45	Junior Training Officer (Textile Mechatronics)	3645	Employment and Training (Training Wing)	State	GT (G)	1
					Total	1
46	Junior Training Officer (Turner)	3646	Employment and Training (Training Wing)	State	GT (G)	1
					GT (W)	1
					BC(OBCM) (G)	1
					MBC/DC (G)	1

					SC(A) (W) (PSTM)	1
					Total	5
47	Junior Training Officer (Welder)	3647	Employment and Training (Training Wing)	State	GT (G)	1
					BC(OBCM) (G)	1
					MBC/DC (G)	1
					SC(A) (W) (PSTM)	1
					Total	4
48	Junior Training Officer (Wireman)	3648	Employment and Training (Training Wing)	State	GT (G)	1
					GT (W)	1
					BC(OBCM) (G)	1
					MBC/DC (G)	1
					MBC/DC (W)	1
					SC(A) (W) (PSTM)	1
					SC (G)	1
					Total	7
49	Junior Training Officer (Advanced CNC Machining Technician)	3619	Employment and Training (Training Wing)	State	GT (G)	12
					GT (G) (PSTM)	4
					GT (G) (LV/VI)	1
					GT (G) (EXSER)	1
					GT (W)	6
					GT (W) (PSTM)	1
					GT (W) (HH/HI)	1
					BC(OBCM) (G)	11
					BC(OBCM) (G) (PSTM)	3
					BC(OBCM) (G) (EXSER)	1
					BC(OBCM) (W)	6
					BC(OBCM) (W) (PSTM)	1
					BC(M) (G)	2
					BC(M) (W)	1
					MBC/DC (G)	8
					MBC/DC (G) (PSTM)	2
					MBC/DC (G) (LD/CP/LC/DF/AC/MuD)	1
					MBC/DC (G) (EXSER)	1
					MBC/DC (W)	4
					MBC/DC (W) (PSTM)	1
					SC(A) (G)	1
					SC(A) (G) (PSTM)	1
					SC(A) (W) (PSTM)	1
					SC (G)	7
					SC (G) (PSTM)	2
					SC (G) (EXSER)	1
					SC (W)	3
					SC (W) (PSTM)	1
					ST (G) (PSTM)	1
					Total	86

50	Junior Training Officer (Architectural Draughtsman)	3615	Employment and Training (Training Wing)	State	GT (G)	1
					Total	1
51	Junior Training Officer (Basic Designer &Virtual Verifier)	3617	Employment and Training (Training Wing)	State	GT (G)	3
					GT (G) (PSTM)	1
					GT (G) (LV/VI)	1
					GT (W)	2
					BC(OBCM) (G)	4
					BC(OBCM) (G) (PSTM)	1
					BC(OBCM) (W)	2
					BC(M) (G)	1
					MBC/DC (G)	2
					MBC/DC (G) (PSTM)	1
					MBC/DC (W)	2
					SC(A) (W) (PSTM)	1
					SC (G)	2
					SC (G) (PSTM)	1
					SC (W)	2
					Total	26
52	Junior Training Officer (Computer Hardware and Network Maintenance)	3618	Employment and Training (Training Wing)	State	GT (G)	1
					SC(A) (W) (PSTM)	1
					Total	2
53	Junior Training Officer (Draughtsman Civil)	3620	Employment and Training (Training Wing)	State	GT (G)	1
					SC(A) (W) (PSTM)	1
					Total	2
54	Junior Training Officer (Electrician)	3623	Employment and Training (Training Wing)	State	GT (G)	2
					GT (W)	1
					BC(OBCM) (G)	2
					BC(OBCM) (W)	1
					MBC/DC (G)	1
					MBC/DC (W)	1
					SC(A) (W) (PSTM)	1
					SC (G)	1
					Total	10
55	Junior Training Officer (Electronics Mechanic)	3622	Employment and Training (Training Wing)	State	GT (G)	1
					GT (W)	1
					BC(OBCM) (G)	1
					MBC/DC (G)	1
					SC(A) (W) (PSTM)	1
					Total	5
56	Junior Training Officer (Engineering Drawing)	3621	Employment and Training (Training Wing)	State	GT (G)	6
					GT (G) (PSTM)	2
					GT (G) (LV/VI)	1
					GT (G) (EXSER)	1

					GT (W)	3
					GT (W) (PSTM)	1
					BC(OBCM) (G)	6
					BC(OBCM) (G) (PSTM)	1
					BC(OBCM) (G) (EXSER)	1
					BC(OBCM) (W)	3
					BC(M) (G)	1
					BC(M) (W)	1
					MBC/DC (G)	4
					MBC/DC (G) (PSTM)	1
					MBC/DC (G) (LD/CP/LC/DF/AC/MuD)	1
					MBC/DC (G) (EXSER)	1
					MBC/DC (W)	3
					SC(A) (G) (PSTM)	1
					SC(A) (W) (PSTM)	1
					SC (G)	4
					SC (G) (PSTM)	1
					SC (W)	2
					Total	46
57	Junior Training Officer (Fashion Design and Technology)	3624	Employment and Training (Training Wing)	State	GT (G)	1
					SC(A) (W) (PSTM)	1
					Total	2
58	Junior Training Officer (Fitter)	3625	Employment and Training (Training Wing)	State	GT (G)	4
					GT (G) (PSTM)	1
					GT (G) (LV/VI)	1
					GT (W)	3
					BC(OBCM) (G)	4
					BC(OBCM) (G) (PSTM)	1
					BC(OBCM) (W)	2
					BC(M) (G)	1
					MBC/DC (G)	3
					MBC/DC (G) (PSTM)	1
					MBC/DC (W)	2
					SC(A) (W) (PSTM)	1
					SC (G)	2
					SC (G) (PSTM)	1
					SC (W)	2
					Total	29
59	Junior Training Officer (Food Production)	3626	Employment and Training (Training Wing)	State	GT (G)	1
					Total	1

60	Junior Training Officer (In-Plant Logistics Assistant)	3628	Employment and Training (Training Wing)	State	GT (G)	1
					Total	1
61	Junior Training Officer (Industrial Robotics and Digital Manufacturing Technician)	3629	Employment and Training (Training Wing)	State	GT (G)	12
					GT (G) (PSTM)	3
					GT (G) (LV/VI)	1
					GT (G) (EXSER)	1
					GT (W)	6
					GT (W) (PSTM)	1
					GT (W) (HH/HI)	1
					BC(OBCM) (G)	11
					BC(OBCM) (G) (PSTM)	3
					BC(OBCM) (G) (EXSER)	1
					BC(OBCM) (W)	6
					BC(OBCM) (W) (PSTM)	1
					BC(M) (G)	2
					BC(M) (W)	1
					MBC/DC (G)	8
					MBC/DC (G) (PSTM)	2
					MBC/DC (G) (LD/CP/LC/DF/AC/MuD)	1
					MBC/DC (G) (EXSER)	1
					MBC/DC (W)	4
					MBC/DC (W) (PSTM)	1
					SC(A) (G)	1
					SC(A) (G) (PSTM)	1
					SC(A) (W) (PSTM)	1
					SC (G)	6
					SC (G) (PSTM)	2
					SC (G) (EXSER)	1
					SC (W)	3
					SC (W) (PSTM)	1
					ST (G) (PSTM)	1
					Total	84
62	Junior Training Officer (Information & Communication Technology System Maintenance)	3627	Employment and Training (Training Wing)	State	GT (G)	1
					SC(A) (W) (PSTM)	1
					Total	2
63	Junior Training Officer (Machinist)	3630	Employment and Training (Training Wing)	State	GT (G)	1
					MBC/DC (G)	1
					SC(A) (W) (PSTM)	1
					Total	3

64	Junior Training Officer (Mechanic Auto Body Repair)	3632	Employment and Training (Training Wing)	State	GT (G)	1
					SC(A) (W) (PSTM)	1
					Total	2
65	Junior Training Officer (Mechanic Electric Vehicle)	3634	Employment and Training (Training Wing)	State	GT (G)	8
					GT (G) (PSTM)	3
					GT (G) (LV/VI)	1
					GT (G) (EXSER)	1
					GT (W)	5
					GT (W) (PSTM)	1
					BC(OBCM) (G)	8
					BC(OBCM) (G) (PSTM)	2
					BC(OBCM) (G) (EXSER)	1
					BC(OBCM) (W)	4
					BC(OBCM) (W) (PSTM)	1
					BC(M) (G)	1
					BC(M) (W)	1
					MBC/DC (G)	5
					MBC/DC (G) (PSTM)	2
					MBC/DC (G) (LD/CP/LC/DF/AC/MuD)	1
					MBC/DC (G) (EXSER)	1
					MBC/DC (W)	3
					MBC/DC (W) (PSTM)	1
					SC(A) (G) (PSTM)	1
					SC(A) (W) (PSTM)	1
					SC (G)	5
					SC (G) (PSTM)	1
					SC (G) (EXSER)	1
					SC (W)	3
					ST (G) (PSTM)	1
					Total	63
66	Junior Training Officer (Mechanic Motor Vehicle)	3635	Employment and Training (Training Wing)	State	GT (G)	1
					Total	1
67	Junior Training Officer (Mechanic Two and Three Wheeler)	3633	Employment and Training (Training Wing)	State	GT (G)	1
					Total	1
68	Junior Training Officer (Workshop Calculation & Science)	3631	Employment and Training (Training Wing)	State	GT (G)	5
					GT (G) (PSTM)	2
					GT (G) (LV/VI)	1
					GT (G) (EXSER)	1
					GT (W)	3

					GT (W) (PSTM)	1
					BC(OBCM) (G)	5
					BC(OBCM) (G) (PSTM)	1
					BC(OBCM) (G) (EXSER)	1
					BC(OBCM) (W)	3
					BC(M) (G)	1
					BC(M) (W)	1
					MBC/DC (G)	4
					MBC/DC (G) (PSTM)	1
					MBC/DC (G) (LD/CP/LC/DF/AC/MuD)	1
					MBC/DC (W)	2
					SC(A) (G) (PSTM)	1
					SC(A) (W) (PSTM)	1
					SC (G)	3
					SC (G) (PSTM)	1
					SC (W)	2
					Total	41
69	Junior Tradesman-Electrician	3659	Metropolitan Transport Corporation Limited, Chennai	Chennai	SF_SC (G)	3
					SF_ST (G)	17
					Total	20
70	Mines Surveyor	3674	Tamil Nadu Minerals Limited	State	GT (G)	1
					BC(OBCM) (G)	1
					Total	2
71	Overseer / Junior Draughting Officer	3558	Rural Development and Panchayat Raj	Dharmapuri	GT (G)	1
					BC(OBCM) (G)	1
					MBC/DC (W)	1
					SC (G)	1
					Total	4
72	Overseer / Junior Draughting Officer	3554	Rural Development and Panchayat Raj	Chengalpattu	BC(OBCM) (G) (PSTM)	1
					Total	1
73	Overseer / Junior Draughting Officer	3556	Rural Development and Panchayat Raj	Coimbatore	BC(OBCM) (G) (PSTM)	1
					Total	1
74	Overseer / Junior Draughting Officer	3557	Rural Development and Panchayat Raj	Cuddalore	BC(OBCM) (G) (PSTM)	1
					MBC/DC (W)	1
					Total	2

75	Overseer / Junior Draughting Officer	3561	Rural Development and Panchayat Raj	Kallakurichi	GT (G) (PSTM)	1
					GT (W) (PSTM)	1
					BC(OBCM) (G) (EXSER)	1
					MBC/DC (G) (LD/CP/LC/DF/AC/MuD)	1
					SC (G)	1
					Total	5
76	Overseer / Junior Draughting Officer	3565	Rural Development and Panchayat Raj	Krishnagiri	MBC/DC (G)	1
					Total	1
77	Overseer / Junior Draughting Officer	3568	Rural Development and Panchayat Raj	Nagapattinam	SC (W)	1
					Total	1
78	Overseer / Junior Draughting Officer	3570	Rural Development and Panchayat Raj	Perambalur	MBC/DC (G)	1
					Total	1
79	Overseer / Junior Draughting Officer	3572	Rural Development and Panchayat Raj	Ramanathapuram	GT (G)	1
					Total	1
80	Overseer / Junior Draughting Officer	3575	Rural Development and Panchayat Raj	Sivagangai	GT (G)	1
					GT (W)	1
					BC(OBCM) (G) (PSTM)	1
					ST (G) (PSTM)	1
					Total	4
81	Overseer / Junior Draughting Officer	3586	Rural Development and Panchayat Raj	Thiruppattur	BC(OBCM) (G)	1
					Total	1
82	Overseer / Junior Draughting Officer	3581	Rural Development and Panchayat Raj	Thiruvannamalai	GT (G)	2
					BC(OBCM) (G)	1
					BC(OBCM) (G) (PSTM)	1
					Total	4
83	Overseer / Junior Draughting Officer	3584	Rural Development and Panchayat Raj	Tiruchirapalli	GT (G) (PSTM)	1
					Total	1
84	Surveyor	3378	Tamil Nadu Housing Board	State	GT (G)	1
					GT (G) (PSTM)	1
					GT (W) (PSTM)	1
					BC(OBCM) (G)	1

					BC(OBCM) (G) (EXSER)	1
					BC(M) (W)	1
					MBC/DC (G) (LD/CP/LC/DF/AC/MuD)	1
					MBC/DC (W)	1
					SC (G)	2
					Total	10
85	Technical Assistant (Civil)	3549	Tamil Nadu Housing Board	State	GT (G)	5
					GT (G) (PSTM)	2
					GT (G) (EXSER)	1
					GT (W)	2
					GT (W) (PSTM)	1
					BC(OBCM) (G)	4
					BC(OBCM) (G) (PSTM)	1
					BC(OBCM) (W)	2
					BC(OBCM) (DW)	1
					BC(M) (G)	1
					BC(M) (W)	1
					MBC/DC (G)	3
					MBC/DC (G) (PSTM)	1
					MBC/DC (G) (EXSER)	1
					MBC/DC (W)	1
					MBC/DC (W) (PSTM)	1
					SC(A) (G)	1
					SC (G)	2
					SC (G) (LD/CP/LC/DF/AC/MuD)	1
					SC (W)	2
					ST (G)	1
					Total	35
86	Technical Assistant (Electrical)	3550	Tamil Nadu Housing Board	State	GT (G)	1
					GT (G) (PSTM)	1
					BC(OBCM) (G)	1
					BC(OBCM) (DW)	1
					Total	4
87	Technical Assistant (Electrical)	3591	Tamil Nadu Power Distribution Corporation Limited	State	GT (G)	74
					GT (G) (PSTM)	20
					GT (G) (LV/VI)	2
					GT (G) (HH/HI)	1
					GT (G) (ASD/ID/SLD/MI/MD)	1
					GT (G) (EXSER)	6
					GT (G) (EXSER) (PSTM)	1
					GT (W)	31
					GT (W) (PSTM)	8

					GT (W) (LD/CP/LC/DF/AC/MuD)	1
					GT (DW)	4
					GT (DW) (PSTM)	1
					BC(OBCM) (G)	63
					BC(OBCM) (G) (PSTM)	17
					BC(OBCM) (G) (LV/VI)	1
					BC(OBCM) (G) (LD/CP/LC/DF/AC/MuD)	2
					BC(OBCM) (G) (ASD/ID/SLD/MI/MD)	1
					BC(OBCM) (G) (EXSER)	5
					BC(OBCM) (G) (EXSER) (PSTM)	1
					BC(OBCM) (W)	26
					BC(OBCM) (W) (PSTM)	7
					BC(OBCM) (W) (LV/VI)	1
					BC(OBCM) (W) (HH/HI)	1
					BC(OBCM) (DW)	3
					BC(OBCM) (DW) (PSTM)	1
					BC(M) (G)	8
					BC(M) (G) (PSTM)	2
					BC(M) (G) (ASD/ID/SLD/MI/MD)	1
					BC(M) (G) (EXSER)	1
					BC(M) (W)	3
					BC(M) (W) (PSTM)	1
					BC(M) (DW)	1
					MBC/DC (G)	47
					MBC/DC (G) (PSTM)	13
					MBC/DC (G) (LV/VI)	1
					MBC/DC (G) (HH/HI)	1
					MBC/DC (G) (ASD/ID/SLD/MI/MD)	2
					MBC/DC (G) (EXSER)	3
					MBC/DC (G) (EXSER) (PSTM)	1
					MBC/DC (W)	19
					MBC/DC (W) (PSTM)	6
					MBC/DC (W) (LD/CP/LC/DF/AC/MuD)	1
					MBC/DC (DW)	2
					MBC/DC (DW) (PSTM)	1
					SC(A) (G)	8
					SC(A) (G) (PSTM)	2

					SC(A) (G) (EXSER)	1
					SC(A) (W)	4
					SC (G)	37
					SC (G) (PSTM)	9
					SC (G) (HH/HI)	1
					SC (G) (EXSER)	3
					SC (G) (EXSER) (PSTM)	1
					SC (W)	15
					SC (W) (PSTM)	4
					SC (W) (HH/HI)	1
					SC (DW)	1
					SC (DW) (PSTM)	1
					ST (G)	2
					ST (G) (EXSER)	1
					ST (W)	1
					SF_ST (G)	171
					Total	656
					Grand Total	**1910**

Annexure VIII

List-I

Mechanical Trades (in Gr-I) Category

Sl. No.	Name of the Trades
1	Fitter
2	Machinist
3	Machinist (Grinder)
4	Maintenance Mechanic (Chemical Plant)
5	Marine Engine Fitter
6	Mechanic Agriculture Machinery
7	Mechanic Machine Tool Maintenance
8	Mechanic Motor Vehicle
9	Operator Advanced Mechanic Tool
10	Painter General
11	Refrigeration & Air Conditioner Technician
12	Spinning Technician
13	Textile Mechatronics
14	Textile Wet processing Technician
15	Tool & Die Maker (press Tools, Jigs & Fixtures)
16	Turner

List-II

Engineering Trades

S. No.	Name of the Trades
1	Advanced CNC Machining Technician
2	Architectural Draughtsman
3	Basic Designer and Virtual Verifier (Mechanical)
4	Civil Engineer Assistant
5	Draughtsman (Civil)
6	Draughtsman Mechanical
7	Electrician
8	Electronics Mechanic
9	Fitter
10	Foundryman
11	In-Plant Logistics Assistant
12	Industrial Painter
13	Industrial Robotics & Digital Manufacturing Technician
14	Information Communication Technology System Maintenance
15	Information Technology
16	Instrument Mechanic
17	Instrument Mechanic (Chemical Plant)
18	Interior Design & Decoration
19	Lift and Escalator Mechanic

20	Machinist
21	Machinist (Grinder)
22	Maintenance Mechanic (Chemical Plant)
23	Manufacturing Process Control and Automation
24	Marine Engine Fitter
25	Mechanic (Motor Vehicle)
26	Mechanic (Tractor)
27	Mechanic Agriculture Machinery
28	Mechanic Auto Body Repair
29	Mechanic Auto Electrical and Electronics
30	Mechanic Autobody Painting
31	Mechanic Diesel
32	Mechanic Electric Vehicle
33	Mechanic Machine Tool Maintenance
34	Mechanic Two & Three Wheeler
35	Operator Advanced Machine Tools
36	Painter General
37	Plastic Processing Operator
38	Plumber
39	Pump Operator-cum-Mechanic
40	Refrigeration and Air Conditioning Technician
41	Sheet Metal Worker
42	Solar Technician (Electrical)
43	Spinning Technician
44	Surveyor
45	Technician Mechatronics
46	Technician Medical Electronics
47	Technician Power Electronics System
48	Textile Mechatronics
49	Textile Wet Processing Technician
50	Tool & Die Maker (Press Tools, Jigs & Fixtures)
51	Turner
52	Welder, Welder (Fabrication & Fitting), Welder (GMAW & GTAW), Welder (Pipe), Welder (Structural), Welder (Welding & Inspection),
53	Wireman
54	Wood Work Technician or Carpenter