

**MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION,  
MUMBAI - 51**

1	Name of Course	<b>C.C. in Repair &amp; Maintenance of Electrical Machine &amp; Power Supply ( 302128 )</b>																																									
2	Max.Nos. of	25 Students																																									
3	Duration	6 Months																																									
4	Type	Full Time																																									
5	Nos Of Days /	6 Days																																									
6	Nos Of Hours	7 Hrs																																									
7	Space Required	Laboratory = 1000 Sq feet Class Room = 200 Sq feet <b>TOTAL = 1200 Sq feet</b>																																									
8	Entry Qualification	S.S.C.+ Any Course Pass in Electrical Group of MSBVEE OR ITI / COE / HSC Vocational in Electrical / Diploma / Degree in Electrical Group																																									
9	Objective Of Syllabus/ introduction	Awareness of Safety precautions. Knowledge of soldering techniques, Testing, use of tools in assembly. Application of Electronic / Electrical competent used in Repair & Maintenance of Electrical Machine & Power Supply. Ability to read schematic layouts wrings diagrams. Repair & Maintenance of Electrical Machine & Power Supply.																																									
10	Employment Opportunity	The trainee will either to be able to take up jobs with agencies which maintain and repair such equipments or with working experience will be in a position to start his own independent Business.																																									
11	Teacher's Qualification	Diploma in Electrical Engineering.																																									
12	Training System	Training System Per Week <table><tr><td><b>Theory</b></td><td><b>Practical</b></td><td><b>Total</b></td></tr><tr><td>12 Hours</td><td>30 Hours</td><td>42 Hours</td></tr></table>							<b>Theory</b>	<b>Practical</b>	<b>Total</b>	12 Hours	30 Hours	42 Hours																													
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## SYLLABUS

### Repair and Maintenance of Electrical Machine and Power Supply

Practical - II	Theory – I
<ul style="list-style-type: none"> <li>• Identification &amp; Testing of different active and passive components.</li> <li>• Supply used of different measuring instruments used in power supply testing and components testing.</li> <li>• Assemble different types of rectifier &amp; different filters ckts a&amp; calculate its ripple factors.</li> <li>• Study of current and voltage source ckts using Op- Amp.</li> <li>• Use of CRO.</li> <li>• Assembles various voltage stabilizers using step -up transformer.</li> <li>• Assemble zener Transistor Series and shunt ) and IC regulator 78/79series,741,LM 723 etc.</li> <li>• Calculate regulation &amp; study of reliability test of above power supply Ckts. •Assemble ckts (Electronics ) with relays used in power supply.</li> <li>• Study &amp; assembling protection ckts used in power supply.</li> <li>• Assemble different types of inverters ckts &amp; its measurements.</li> <li>• Assemble battery changers ckts used in inverters with protection ckts.</li> <li>• Assemble on -line, Off line UPS &amp; its measurements.</li> <li>• Assemble CVT &amp; its measurements.</li> <li>• Assemble /study of SCVS ckts.</li> <li>• Study &amp; measurements of given SCR power supply ckts.</li> <li>• Study &amp; Measurements of given SMPS.</li> <li>• Study fault finding of given power supply.</li> <li>• Speed control of motors.</li> </ul>	<ul style="list-style-type: none"> <li>• Review of electrical machines such as Three Phase Induction Motor, Single Phase Induction Motor.</li> <li>• Review of electrical instruments. •Review of transformer winding.</li> <li>• Study of active and passive components used in power supply.</li> <li>• Different measuring instruments used in power supply testing and measurements. (e.g. analog and digital multi - meters, LCR, meters, power and energy meters, frequency counters, CRO etc.</li> <li>• A.C to D.C. converter (Rectifiers &amp; ripple filters EMI/RFI filters.</li> <li>• Constant current and voltage source.</li> <li>• A.C. voltage stabilizer.</li> <li>• Linear voltage regulator &amp; its types. (Transistorized &amp;IC regulator.)</li> <li>•Reliability Test/Regulation test of D.C. power supplies.</li> <li>• Stabilizer with using electronic circuit.</li> <li>• Protection ckts used in power supply.</li> <li>• D.C. to A.C. converter, Types of inverter, its different blocks &amp; oscillators ckts.</li> <li>• Battery changers &amp; its protection ckts.</li> <li>• UPS working principles of f-line &amp; On line UPS ckts used in UPS.</li> <li>• CVT working and principles.</li> <li>• Various circuits used in servo controlled voltage stabilizers.</li> <li>• SCR power supply ckts.</li> <li>• SMPS ckts and its types.</li> <li>• Fault finding &amp; their remedies.</li> </ul>

## Basic Electronics & Assembly Technique

<b>Practical - I</b>
Tool Identification, safety precautions, Familiarization with Electronic Components.  Different Type of Soldering Iron. Use of Soldering Iron. Color Code of Fixed Resistors.
Use of various Meters for Measuring Voltage, Current , Resistance etc. Safe Handling of Instruments . Use of Digital & Analog Multimeter. Familiarization with CRO. Measurement of L, C and R using LCR bridge.
Identification & Testing of various types of Diodes. Familiarization with CRO, Operating knobs. Construction of Half Wave & Full Wave Rectifiers. Calculation of Ripple using Filters to improve DC Output
Transistor Testing, study the transistor characteristics. Construction of single stage amplifier. Construction of a transistor- switch and to drive a relay.
Construction of RC Phase Shift Oscillator. Construction of Astable and Bistable multivibrator.
Plotting of V-I Characteristics of SCR/Triac, study of light Dimmer.
Lab Demonstration of all types of Digital Logic Gates. Verification of all truth table.  Familiarization with various IC and their Packages.

### Tools & Equipment --

<b>Sr. No.</b>	<b>Name of Items</b>	<b>No.s Required</b>
1.	Measuring Tape Steel 100cm	10 Nos.
2.	Rule Steel 300cm	10 Nos.
3.	Screw Driver heavy duty 200mm insulated thick stem	10 Nos.
4.	Screw Driver heavy duty 250mm with insulated thick stem handle	10 Nos.
5.	Plier Insulated combination 200 mm	10 Nos.
6.	Knife double blade electrician 100mm	10 Nos.
7.	Pincer 150mm	10Nos.
8.	Scriber 150mm x 4mm	10 Nos.
9.	Punch center 150mm x 8mm	10 Nos.
10.	Hammer ball pien 0.75kg with handle	10 Nos.
11.	Hammer cross pien 115gms with handle	10 Nos.
12.	Saw Tenon 250mm	10 Nos.
13.	Firmer chisel wood 12mm	10 Nos.
14.	Gimlet 6mm	10 Nos.
15.	Bradawl 100mm	10 Nos.
16.	Wire stripper 150 mm	10 Nos.
17.	Heat sink plier	10 Nos.

**List of Tools & Equipments for Workshop - EAT**

<b>S. No</b>	<b>Name Of Items</b>	<b>Quantity</b>
1.	Screw driver 100 mm.	4 Nos.
2.	Screw driver 300 mm.	4 Nos.
3.	Plier Gas 250 mm.	4 Nos.
4.	Plier Gas 200 mm	4 Nos.
6.	Plier round Nose 150 mm.	4 Nos.
8.	Plier Flat Nose 150 mm.	4 Nos.
9.	Tweezers 100 mm.	4 Nos.
10.	Soldering Iron 75 watt.	2 Nos.
11.	Soldering Iron 25 watt.	2 Nos.
12.	Soldering Iron 65 watt.	2 Nos.
13.	Soldering gun	2 Nos.
14.	Spanner Kit (Double Ended).	2 set.
15.	Drill machine Hand 0- 6 mm capacity.	4 Nos.
16.	Drill machine electric Portable 0- 6 mm capacity.	1 No.
17.	AC Bridge.	1 No.
18.	Oil can 0.12 liter.	4 No.
19.	Allen key.	1 set.
20.	Grease Gun (medium size)	1 No.
21.	Grease Gun (small size).	1 No.
22.	Hack saw frame 150 mm.	2 Nos.
23.	Hack frame 200 mm.	4 Nos.
24.	Snip straight 150 mm.	4 Nos.
25.	Snip curved 150 mm.	4 Nos.
26.	Rubber Gloves pair.	4 Nos.
27.	Spanner single ended 6mm - 25 mm.	1 set.
28.	Spanner double ended 6 mm -19 mm.	1 set.
29.	Drills S.S. twist block 2 mm- 12 mm.	2 set.
30.	File flat 150 mm 2 <sup>nd</sup> cut.	4 Nos.
31.	File flat 150 mm bustard.	4 Nos.
32.	File round 100 mm bustard.	4 Nos.
33.	File round 150 mm 2 <sup>nd</sup> cut.	4 Nos.
34.	File flat 150 mm smooth.	4 Nos.
35.	Instrument files (set of 12).	1 No.
36.	Bench vice 100 mm jaw.	2 Nos.
37.	Tap set 3 mm- 10 mm (set of 9).	2 set.
38.	Die set 3mm - 10 mm (set of 9).	2 set.
39.	Vice hand 50 mm jaw.	4 Nos.
40.	Multi meter (digital).	2 Nos.
41.	Ammeter MI, 0-2 A.	2 Nos.
42.	Ammeter MI, 0-5-10-15 A.	2 Nos.
43.	Tong tester .	2 Nos.
44.	Voltmeter 0-150-300- 600 V.	2 Nos.
45.	C T.	2 Nos.
46.	P T.	2 Nos.
47.	Frequency meter (Digital & Analog).	2 Nos.
48.	Megger 500 V.	2 Nos.
49.	Wheat stone bridge.	1 No.
50.	Earth fault locator.	1 Nos.

51.	Earth tester.	1 No.
52.	Energy meter single phase 40 A 230 V.	2 Nos.
53.	Energy meter 3 phase, 20 A 400 V.	2 Nos.
54.	Watt meter single phase 230 V, 3 KW.	2 Nos.
56.	Wattmeter 3 phase 400 V, 2 elements 3/5 KW.	2 Nos.
57.	Crimping tool.	2 Nos.
58.	Signal generator.	2 Nos.
59.	CRO.	2 Nos.
60.	LCR meter.	2 Nos.
61.	Voltage stabilizer.	2 Nos.
62.	Battery charger Input- 230 V, Output-0-35V.	1 No.
63.	UPS (On line)	2 Nos.
64.	UPS (Off Line).	2 Nos.
65.	CVT.	2 Nos.
66.	SMPS.	2 Nos.
67.	Inverter 1 KVA, (MOSFET Tech).	2 Nos.
68.	AutoTransformer, Input 230V,Output0-270 V.	2 Nos.
69.	Auto Transformer 3 phase Input 230 V, Output, 0270 V.	2 Nos.
70.	Multimeter Analog.	2 Nos.
71.	Transistor Tester.	2 Nos.
72.	IC Tester.	2 Nos.
73.	Microprocessor Kit.	1 No.
74.	IC Trainer (Digital)	1 No.
75.	Lead acid battery 60 AH.	1 No.
76.	Fire Extinguisher.	2 No.
77.	Fire Buckets.	4 Nos.
78.	Watt meter single phase, single element (Flush mounting type) multi Range: 0-750-1500 Watt. rectangular shape.	4 No.
79.	Ammeter MI type, Rectangular shape, flush mounting,size106x84mm, multi range, 0-5-10 A.	4 No.
80.	Voltmeter MC type AC, Rectangular shape, flush mounting,size106x84mm,multi range,0-150-300 V.	4 No.
81.	Auto Transformer, continuous variation, single phase, flush mounting type, 0- 270 V, 5 A.	4 Nos.
	<b>Furniture</b>	
82	Locker cup board 195cmx110cm with 45 x 45 x 45 cm locker	1 Nos.
83.	Bench working 2.5X1.20X0.75 meter Almirah 2.5X1.20X0.75 meter	4Nos.
84.	Instructor chair	1Nos.
85.	Instructor table.	1
86.	Student chair (steel)	25
87.	Lecture table	1
88.	Revolving stool	25 Nos.
89.	Writing white board	1
90.	Table teak wood for Electrical Lab size 72 x 24 x	4 Nos.
91.	30 cm height, provided with drawers and storage,	.
92.	fitted with panel board size 15x 25 x 12 cm height.	2 Nos.
93.	Metal Rack180 X 150 X 45 cm	2 Nos