

MAHARASHTRA STATE BOARD OF VOCATIONAL EXAMINATION, MUMBAI

1	Name of Syllabus	C.C. in Repair & Maintenance of Electronic Test Equipment (301131)																																									
2	Max. Nos of Students	25 Students																																									
3	Duration	6 Months																																									
4	Type	Full Time																																									
5	Nos Of Days / Week	6 Days																																									
6	Nos Of Hours /Day	7 Hrs																																									
7	Space Required	Laboratory = 1000 Sq feet Class Room = 200 Sq feet TOTAL = 1200 Sq feet																																									
8	Entry Qualification	S.S.C. + any course pass in Electronic 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 Radio, Audio, Video System and Appliances. Ability to read schematic layouts wiring diagrams. Repair & Maintenance of Radio, Audio, Video System and Appliances.																																									
10	Employment Opportunity	The trainee will either to be able to take up jobs with agencies which maintain repair such equipments or with working experience will be in a position to own independent Business.																																									
11	Teacher's Qualification	Diploma /Certificate in concern subject																																									
12	Training System	<table><tr><td colspan="3">Training System Per Week</td></tr><tr><td>Theory</td><td>Practical</td><td>Total</td></tr><tr><td>12 Hours</td><td>30 Hours</td><td>42 Hours</td></tr></table>							Training System Per Week			Theory	Practical	Total	12 Hours	30 Hours	42 Hours																										
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13	Exam. System	<table><tr><td>Sr.</td><td>Paper Code</td><td>Name of Subject</td><td>TH/PR</td><td>Hours</td><td>Max. Marks</td><td>Min. Marks</td></tr><tr><td>1</td><td>30113111</td><td>Repair & Maintenance of Electronic Test Equipment</td><td>TH I</td><td>3 hrs</td><td>100</td><td>35</td></tr><tr><td>2</td><td>30113121</td><td>Basic Electronics & Assembly Technique</td><td>PR I</td><td>3 hrs</td><td>100</td><td>50</td></tr><tr><td>3</td><td>30113122</td><td>Repair & Maintenance of Electronic Test Equipment</td><td>PR II</td><td>6 hrs</td><td>200</td><td>100</td></tr><tr><td></td><td></td><td>TOTAL</td><td></td><td></td><td>400</td><td>185</td></tr></table>	Sr.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Min. Marks	1	30113111	Repair & Maintenance of Electronic Test Equipment	TH I	3 hrs	100	35	2	30113121	Basic Electronics & Assembly Technique	PR I	3 hrs	100	50	3	30113122	Repair & Maintenance of Electronic Test Equipment	PR II	6 hrs	200	100			TOTAL			400	185						
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Repair & Maintenance of Electronic Test Equipment

Topic	Practical	Theory
Repair & Maintenance of Electronic Test Equipment	Familiarization with: Analog Multimeter ,Digital Multimeter, Function Generator Oscilloscopes ,DC Power Supply ,LCR Bridge ,Sine & Square Wave Oscillator ,RF Oscillators (Signal Generators) Digital IC Tester ,EPROM Programmers Universal programmers	Introduction to various Electronic Test Equipment
	Identification of components: Resistor – Value & Wattage , Finding value from colour code Wattage . Capacitor-Type of capacitors, Polarized & Non-polarized capacitors, Reading value, working voltage & tolerance of a capacitor Transformers & coils-step down and step up transformer, Air-core coil ,Iron-core coil ,Ferrite core coil Variac	Review of passive Electronic components ,their specifications and applications: Resistor ,Capacitor ,Inductor Transformers, choke coils, various switches
	Identification of Diodes: Types of Diodes, Identifying the anode & cathode , Identification of transistor : Types of transistors – NPN/PNP Lead identification (EBC),Signal transistors, Medium power transistors & Power transistors Identification and testing of : N channel & P channel FET, ,MOSFET-IGBT , UJT, SCR , TRIAC & DIAC Testing and use Linear Ics-Op Amps & Comparators	Review of active components: Diode , precision rectifiers ,Transistors , LED, FET, MOSFET, SCR ,TRIAC and DIAC,OP-AMP
	Testing of TTL and CMOS IC Identification and use of Logic Tester and Logic Clip	Review of Basic Logic gates ,TTL and CMOS Integrated circuits Logic Tester/Logic Clip: Use and working of Logic tester and Logic Clip
	Execution of program instruction on 8085 Execution and testing of program instruction on 8031/8051 Micocontroller. Testing Memory IC ,Testing Peripheral IC, Testing of Microprocessor -Testing IC in Step mode ,Testing IC in HUNT mode ,Interfacing IC Tester to a PC	Microprocessor : basic architecture , programming, (8 bit) interfacing , DMA Microcontroller : basic architecture , programming, (8 bit) interfacing , DMA
		Memory classification , Memory Ics-

		RAM, ROM, EPROM
	Study of EPROM Programmer : Specifications and block diagram , Introduction to EPROMS Operation of a EPROM programmer , Circuit description (in brief)	Familiarization with an EPROM programmer- Front panel controls, switches & displays Using program perform : Read , Blank check , Burn ,Verify
	Study of Universal Programmer – PC Interface : Specifications and block diagrams , Interfacing programmer to a PC	Installing the universal programmer with a PC Selecting the device to be programmed Programming various devices using programmer
	Study of Analog Multimeter : Block diagram & specifications, Construction of moving coil meter (PMMC),DC Voltage measurement circuit AC voltage measurement circuit ,Resistance measurement circuit ,DC Current measurement circuit	Construction of moving coil meter movement ,Circuit tracing & identifying components of (a) DC voltage measurement circuits (b) AC voltage measurement circuit (c) DC current & (d) Ohms/Resistance measurement circuit
	Study of Digital Multimeter : Specifications , Block diagram ,Displays – LED, LCD Introduction & methods used for Analog to Digital Converters (Dual slope A/D converter) IC used in DMM for A/D conversion for 3 ½ digit & 4 ½ digit IC 7106 ,IC 7107, etc. Circuit description of (a) DC voltage measurement (b) AC voltage measurement, (c) DC current measurement ,(d) AC current measurement (e) Resistance measurement. DMM Trouble shooting and calibration procedure.	Doing measurement using DMM & checking its performance on DC Voltage ,AC Voltage, DC mA, AC mA, & Resistance measurement ranges. Opening a Digital multimeter and identifying the components used in it. Testing the display : LED , LCD type displays. Identifying and tracing circuit related to A/D converter & other section's & its trouble shooting. Testing the performance of DMM using standard/calibrator.
	Study of CRO : Specifications and block diagram , Familiarization with front panel and controls of a CRO. Study of CRO circuits (a) Vertical preamp (b) Vertical Intermediate amplifier (c) Vertical Final amplifier (d) Time base circuits, (e) Horizontal Final amplifier (f) Low voltage & EHT power supply circuits. Study of H V circuits Digital storage and IEEE interface of a oscilloscope. Trouble shooting procedure of a CRO.	Doing measurement using CRO – Measurement of DC Voltage, AC voltage, Period & Frequency & observing voltage and wave form measurement. Troubleshooting CRO Vertical Preamplifier & all other sections (a) to (f). Familiarize and doing measurement using Digital storage oscilloscope Interfacing DSO with a PC (IEEE)
	Study of Function Generator : Specifications & Block diagram ,	Familiarization with front panel controls of a Function Generator

	Study of circuit used in	Opening a Function Generator and identifying the components used in it
	Circuit tracing and identifying circuit as per block diagram , Voltage & waveform measurement at different section of a Function Generator Testing the performance of it	Function Generator using: (a) Discrete components and (b) custom built ICs (Function Generator (ICs) Microprocessor / Microcontroller based Function generator Trouble shooting on function generator
	Familiarization with front panel and controls of a LCR bridge and measurement of Resistance , Capacitance , Inductance 7 Q.	Study of LCR Bridge : Specifications and Block diagram , Types of Bridge – DC & AC , Circuits used. LCR-Q Bridge with Auto-compute facilities.
	Familiarization with front panel & control of a Sine wave, Square wave and RF-Signal Generator generator Observe and study the output waveforms of a sine and square wave generator using CRO Observe and study the output waveforms of a RF-Signal Generator using CRO	Study of a Sine , Square wave Generators & RF signal Generators : Specifications & Block diagram , Circuit operation
	Familiarization with different types of Power Supply Testing Power Supplies as per its specifications : a) Line Regulation ,(b) Load Regulation (c) Ripple Assemble , test and fault finding in IC regulators Identification of different section of SMPS Assemble, test and fault finding of SMPS	Study of Power Supplies : specifications & block diagram , Linear power supplies Fixed output voltage , Variable output voltage (adjustable output) , Power supply using 3-pin IC regulator-Circuit description SMPS -Specifications and block diagram & Circuit description
	Familiarization with front panel controls and display system Testing of : TTL , CMOS ,Memory ,Peripheral Ics Testing of Microprocessor Familiarization with front panel controls and display system Testing of OP-AMP,Comparators	Study of a Digital IC Tester : Specifications & Block diagram , Operation and circuit description of of a Digital IC Tester Study of a Linear IC Tester ; Specifications and block diagram , Operation of a Analog IC Tester and its Circuit description (in brief)
	Identify various parts/ section , controls and features of Pattern Generator , Logic Analyser, Microprocessor based Recorder, IEEE interface Multimeter, Spectrum Analyser , Frequency counter , Barcode reader.	Specification & block diagram of Special equipment : Pattern Generator, Logic Analyser, Microprocessor based Recorder, IEEE interface Multimeter, Spectrum Analyser, Frequency counter ,Barcode reader

Practical - I - Basic Electronics & Assembly Technique

<i>Topic</i>	<i>Practical - I</i>
Basic Electronics & Assembly Technique	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.

Repair & Maintenance of Electronic test equipments Equipment List

Description of Item	ToolKit
Digital Multimeter	10
Analog Multimeter	8
Basic Electronics Trainer with bread board facility	4
Power Electronics Trainer with bread board facility	4
Digital IC Trainer(TTL & CMOS) with bread board facility	4
Linear IC Trainer with bread board facility	4
Logic Clip	4
Logic Tester	4
8085 basedMicroprocessor Trainer kit(8 bit) with peripheral study boards	4
8031 based Microcontroller Trainer Kit (8bit)	4
EPROM programmer	2
Universal/PAL programmer	2
Digital Multimeter Trainer.	2
20 MH Oscilloscope Trainer	4
Function generators with different O/P	8
LCR bridge	2
RF/AF signal generators Trainer	2
Power supplies 0-30V variable regulated DC	8
IC based Power supply 5V,12V-1 Amp	8
SMPS Trainer 5V/12 V	2
Color pattern generator	1
Logic analyzer	1
Microprocessor based recorder	1
IEEE interface Multimeter	2
Frequency Analyser	1
Barcode reader	1
