

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

1	Name of Syllabus	C. C. IN ELECTRICAL ASSISTANT (302113)																																								
2	Max.Nos of Student	25 Students																																								
3	Duration	6 MONTH																																								
4	Type	Part Time																																								
5	No Of Days / Week	6 Days																																								
6	No Of Hours /Days	4 hrs.																																								
7	Space Required	1) Workshop = 800 sqfeet 2) Class Room = 200 sqfeet TOTAL = 1000 sqfeet																																								
8	Entry Qualification	8 th Pass																																								
9	Objective Of Syllabus/ introduction	A trainee shall know : 1) The shop discipline and lay - out . 2) Safety precautions , firefighting equipments first aid etc. 3) Hand tools used in Electrical work.4)Electrical wiring																																								
10	Employment Opportunity	1) carry out the repairs and maintenance of Electrical equipments, in Electrical work shop 2) carry out the repairs of household appliances. 3) Household / Industrial Electrical wiring work.																																								
11	Teacher's Qualification	1)ITI,NCTVT electrician PASS 2)MCVC MREDA PASS & ONE YEAR EXPEREANCE																																								
12	Training System	<table><tr><th colspan="7">Training System Per Week</th></tr><tr><td>Theory</td><td colspan="2">Practical</td><td colspan="4">Total</td></tr><tr><td>6 hrs</td><td colspan="2">18 hrs</td><td colspan="4">24 hrs</td></tr></table>						Training System Per Week							Theory	Practical		Total				6 hrs	18 hrs		24 hrs																	
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THEORY – I, BASIC ELECTRICITY

1. Introduction of the trade, scope of the trade Safety precautions of the workshop , Electricity. Elementary first- aid, resuscitation and treatment for electric shock and burns. Description, specification , General care and maintenance of common hand tools.
2. Fundamental terms, Definition , and units, voltage current and resistance. Qualities of good electrical conductor , common conductor material , shape , size. Insulated conductor , use , kinds, specification of conductor over cables, use of wire gauges. Soldering , its purpose , different percentage of solder, types , of different flux and use. Description of soldering equipment.
3. Common electrical accessories , their specifications and use. Ohm's law and its application , Simple calculations. Different types of resistances , series connections, characteristics and simple calculations. Different types of resistances parallel connections and simple calculations.
4. Different types of resistances, series and parallel connections. Short circuit , open circuit , closed circuit , fuse - types and rating. Work , Power , energy units , calculation of power in simple electrical circuit.
5. Principle of Electrolysis , Faraday 's law of electrolysis . Types of cells , Simple calculation of series, parallel and series parallel. Construction of ammeter, voltmeter, connections and use .
6. Types of wires , specification , use and voltage grade. Type of wiring, CTS, TRP , PVC , PVC casing & capping, PVC conduit wiring , LC wiring, concealed wiring.
7. Introduction of fitting trade, safety precaution. Description, specification , General care and maintenance of common fitting tools. Types of drill, description of drilling machine, use , care and maintenance. Description of taps and dies.
8. Description of carpenter hand tools, care and maintenance. Types of soldering irons , their proper uses. Properties of magnet , electro - magnetism , cork screw rule , Thumb rule. Magnetic field of current carrying conductor.
9. Principle of electro - magnetic induction , Faraday's law , Lenz Law. Principle of D.C .Generator and its parts. Types of Generator, (Series , Shunt , Compound , long shunt and short shunt)

10. Properties and use ,copper , aluminum , zinc , lead tin, brass and bronze. Principle of D.C. Motor and parts. Type of D.C . Motor and uses Necessity of starter.
11. Types of D.C. Motor starters Speed control of D.C. Motors D.C.Motors : their advantages and disadvantages and Industrial Applications.
12. Types of Cables Application, selection and specifications of each type of cable. Types of Armored cable , use, construction and specification.
13. Free hand sketch of common hand tools Free hand sketch of wiring accessories. Lead acid cell, construction , Parts and working principle.
14. Free hand sketch of electrical sign and symbol C.G.S. and F.P.S. system of unit of force, weight etc. Conversion and problems.
15. Alternating current A.C. simple circuit with
 - a) Resistance only,
 - b) Inductance only.
 - c) Capacitance only , inductive reactance , capacitive reactance.
16. Free hand sketching of wiring accessories. Ratio and proportion and simple problem. Phase Relationship between current and voltage in A.C . simple circuit.
17. Power & Power factor in A.C. Single phase circuit and its calculations. Simple graphs & Free hand sketching of rivets and washers. A. C. circuit containing R. & L. in series Example on R . & L . in series.
18. Free hand sketch of keys & Screw threads. Simple problem on work A. C. Circuit containing R. L. & C. in series. Simple Example on R. L . & C. in series.
19. Types and function of capacitor Specifications of capacitor
20. A. C. single phase energy meter. Principle parts & function . Creeping error and adjustment reading name plate for specifications. Principle and working of Wattmeter. Principle of Ohmmeter.
21. Simple orthographic projection (3 rd angle)
22. Calculation of energy and Power Advantage of single phase and three phase supply. System of connection in three phase A . C (Starter & Delta) Relation between phase value and line value of current and voltage.
23. Three Phase , for wire system Principle of A. C. Motors and its parts Rotating Magnetic field Types of A. C . Motors, single phase & three phase.
24. Working and principle of
 - 1) Capacitor type motor
 - 2) Capacitor start motor.
 - 3) Double capacitor motor
 - 4) Shaded pole motor.
 - 5) Repulsion type & Universal Motor.

- 6) Squirrel cage 3 induction motors.
25. Working principle of slip ring induction motor.
Types of A.C. starter, a) D.O.L. Starter,
b) Star - delta manually operator starter
26. Principle of single phase and 3 phase Transformers.
Application and working principle of Multimeter.
27. Construction parts of electric iron Construction and working principle of thermostat .
Trouble shooting of electric iron
Servicing and repairing of electric iron
Construction parts of geyser.
28. Construction and working principle of geyser.
Trouble shooting of geyser .
Construction and parts of hot plate.
Trouble shooting of hot plate.
29. Servicing and repairing of hot plate
Construction & Parts of mixer & Grinder.
Servicing and repairing of mixer & grinder.
30. Servicing and repairing of ceiling fan , fan and regulator.
Trouble shooting of ceiling fan and regulator
31. Necessity of earthing and types of earthing .
Pile earthing , plate earthing and water main earthing. Earthed electrodes , earth continuity conductor and earthing lead.
32. Incandescent Lamps - types – specification life construction and working principle and parts of the fluorescence tube light.
Construction and parts , working principle of mercury vapour lamp. Construction Parts & working principles of sodium vapour lamp.
33. Testing - a) Insulation , b) Continuity ,
c) Resistance by ohmmeter, voltage and current by voltmeter and ammeter.
Pipe vice , pipe cutters, branches , chisels and hacksaw for cutting pipes, pipe wrench.
Study of pipe fitting (coupling, flanges nipples, unions bends, elbows, reducers, tees)
34. Study of pipes used for water pumps (Cement, G.I. , C.I., C.I. flexible hose pipe. Polytheiene pipe, low density and high density) Different types of pipe jointing material like white lead, jute packing paper, asbestos tape.
Atmospheric pressure, purpose of foot valve, priming. Working principle of centrifugal reciprocating pumps.

PRACTICAL - I, WIRING PRACTICALS

1.	Introduction to make the trainees familiar with shop discipline layout of the shop machine. Prepare termination , skinning of cable , Aluminum and copper conductor. To make a simple twist joint in single conductor , married joint in standard conductor. Make a tee joint in standard conductor. Prepare joint on bare conductor , Britannia straight , Britannia ' T ' , Western Union Joint.
2.	Practice of soldering , copper and aluminum. Conductors joints, soldering lugs to a copper conductor. Soldering lugs/ ferules in an aluminum cable. Crimping conductor cable end with lug, standard conductor and flexible conductor.
3.	Practice in connecting different lighting accessories specification and use. Two lamps in series with unequal wattage. Measure current to the lamp and voltage across each lamp. From the parallel circuit and find the effect of short and open in parallel cit.
4.	From the series cit. and find out the effect of short and open in series cit. Install the given domestic appliances and test for its working , heater element , kettle and electric iron. Simple series and parallel connection.
5.	Two lamps control in series. Two lamps control in parallel Two lamps control in series and two lamps control in parallel. Measurement of power in series and parallel. Connection of ammeter and measure the current.
6.	Connection of voltmeter and measure the voltage. Connection of ammeter and voltmeter and measure the current and voltage. One lamp control in C .T. S. System. Two lamps control in CTS system Stair case wiring in CTS system.
7.	Godown wiring in CTS system. Tunnel wiring in CTS system Two lamps control in series and parallel in CTS system. Marking of the given MS Flat. Drilling , Threading
8.	Preparation of electro - magnet Verification of right hand rule by compass needle. Connecting call bell. Connecting bell Indicator (number type of lamp type) Two lamps control in PVC system.
9.	House wiring in PVC System Two and half point wiring in PVC system. Prepare the house wiring socket , switches, D. P. etc.)

10.	Make the joints of PVC casing and capping Lamps control from two places PVC casing and capping system.
11.	Tunnel wiring in PVC casing capping system Hospital wiring in PVC casing capping system Study the parts of DC Generator.
12.	To start the D. C. shunt Generator and measure the Voltage. To start the D.C. Compound Generator and measure the Voltage.
13.	Sawing practice Preparing of simple joint Study of the parts of the D. C. Motor To start the DC series Motor on load and Reverse direction.
14.	To start the DC shunt motor and reverse the direction. To start the compound motor and reverse the direction.
15.	Study parts of lead and cells. Metal conduct pipe cutting and threading. Fitting conduct accessories. One lamp control in metal conduct wiring .
16.	Stair case point in metal wiring conduct. Godown wiring in metal conduct. Fixing of D.B.& D.P. In metal conduit system. Provide circuits in metal conduct system.
17.	Measurement of choke inductance.
18.	Connection of single phase energy meter with load. Measure energy in S. P. circuit by energy meter. To connect the wattmeter at the given load & measure the power. To connect ammeter, voltmeter, wattmeter at the given load and measure the current, voltage and power.
19.	R & L connected in series and measure the power factor. To measure the Resistance by Ohmmeter. To connect the energy meter of the given load and calculate the error.
20.	Measure the voltage in a single phase supply by voltmeter Measure the phase to phase voltage by Voltmeter. Measure the line voltage in 3 supply. Measure the balance load in 3 supply wattmeter. Measure the power in 3 supply unbalance load by three wattmeter method.

PRACTICAL II, ELECTRICAL APPLIANCES

1	To make a star connection in 3 supply. To make delta connection in 3 supply. To study the parts of A. C. motors, (Single phase) Study the parts of three phase motors.
2	To connect the permanent capacitor motor to the supply. Start and reverse the direction. To check the capacitor, running , winding and starting winding by Ohmmeter & test lamp. To check capacitor, running winding and starting winding and centrifugal switch. To start the capacitor running motor reverse .
3	Study the parts , construction of the repulsion motor. To start the repulsion Motor & change the D.O.R. Study the parts of the Universal Motor. Start the Universal Motor and change D.O.R. Universal. Study the parts , construction of the squirrel cage 3PH INDUCTION MOTOR
4	Study the parts , construction of the repulsion motor. To start the repulsion Motor & change the D.O.R. Study the parts of the Universal Motor. Start the Universal Motor and change D.O.R. Universal. Study the parts , construction of the squirrel cage 3 induction motors.
5	Start the squirrel cage 3 induction motors and change the D.O.R. & measure full load & No. load current. Start the double squirrel cage motor. Study the parts & construction of D.O.L. starter, connection. Function of overload and N.V.C.
6	To connect the D.O.L. starter 3 induction Motor start & reverse the D.O.R. To connect the star delta starter to the sq. tag motor. Function and study the auto – transformer starter to 50 H.P. Motor and start the motor. Study the parts of manual operated D.O.L. Starter.
7	Study the parts of manually operated star delta starter. Study the parts & construction and connection of slip ring motor starter. Study the parts and connection of Insulation tester. Study the parts & construction of 3 - transformer. Testing of primary & secondary winding.
8	Study the parts connection of the electric iron and testing. Study the faults , trouble shooting and remedies. Study the parts, connection of the Geyser. Dismantle, replacement , refitting and testing of geyser. Faults , trouble shooting and remedies of the geyser.
9	Study the parts of the electric hot plate. Faults , trouble shooting and remedies of hot plate. Dismantle , replacement and reassembly and testing of the hot plate. Study the parts and construction of mixer grinder. Faults, trouble shooting and remedies of mixer.

10	Dismantle, replacement and reassembly and testing of mixer Grinder. Study the parts and construction of ceiling fan. Faulting trouble shooting and remedies of ceiling fan. Dismantle replacement and reassembly and testing of the ceiling fan. Study the parts and construction of regulator.
11	Faults, trouble shooting and remedies of regulator. Dismantle , Replacement and reassembly and testing of Fan regulator. To make the plate ear thing. To make the pipe ear thing To study the parts of Incandescent lamp and fluorescent tube light.
12	Connection of the all parts of tube light. Fault, trouble shooting, replacement and reassembly of the parts. Study the parts and construction of mercury vapour lamp. Connection of mercury vapour lamp. Fault finding and replacement of parts and reassembly of the complete fitting.
13.	Study the parts and construction of the Sodium vapour lamp. Connection of all parts of sodium vapour lamp. Study the parts of Armature, count the slots as per name plate to calculate the front pitch and back pitch. To remove the old coil and cleaned the armature To fix the coil as per development diagram.
14	Types of taps and valves used on pipes. Repair and use of foot values. Non return valves , pressure release valves. Sleeve valves , stop valves. Maintenance of lump sets, valves.
15	Alignment with pumps.

LIST OF TOOLS & EQUIPMENT

Sr. No.	Trainees ' Kit	Quantity
1.	Rule wooden 4 fold 600 m.m	2
2.	Scriber 15 mm x 4 mm. (knurled centre portion)	2
3.	Pincer 150 mm.	2
4.	Pliers insulated 150 mm.	3
5.	Screw Driver Insulated 150 mm.	3
6.	Punch Centre 150 mm. x 9 mm .	2
7.	Knife double bladed electrician	4
8.	Hammer Cross pin 115 grams. With handle.	2
9.	Electrician connector, insulated handle.	4
10.	Electrician Testing Pencil (Neon tested) 500 V.	4
11.	Heavy duty Screw driver 200 mm. (Insulated)	2
12.	Heavy duty screw driver 250 mm. (Insulated)	2
13.	Rule Steel 300 mm.	2
14.	Saw Tenon 250 mm.	4
15.	Hammer Ball Pin 0.75 kg. with handle.	2
16.	Firmer chisel wood 12 mm.	2
17.	Gimlet 6 mm.	2
18.	Bradawl – 8”	2
19.	Side outing Pliers Insulated	4

20	Spanner 150 mm. adjustable 15 degree.	1															
21	Blow lamp 5 liters.	1															
22	Melting pot	1															
23	Ladder	1															
24	Chisel cold flat 12 mm x 200 mm.	2															
25	Chisel wood firmer 25 mm. and 6 mm.	2															
26	Drill machine hand to 5 mm. capacity	2															
27	Electric drill machine portable 6 mm capacity	1															
28	Oil can 0.12 liter.	1															
29	Grease gum .	1															
30	Pulley Puller	1															
31	Rawl plug tool with Bit 6 No. & 8 No.	2															
32	Bearing puller	1															
33	<p>Variable Resistance 0 to 2000 Ohms 2.5 to 5000 volt</p> <table border="1"> <tr> <td>10R</td><td>5.2 amp.</td><td>1Nos.</td></tr> <tr> <td>20R</td><td>2.7 amp.</td><td>1Nos.</td></tr> <tr> <td>50R</td><td>4.1 amp.</td><td>1Nos.</td></tr> <tr> <td>296R</td><td>2.8 amp.</td><td>1Nos.</td></tr> <tr> <td>190R</td><td>3.3 amp.</td><td>2Nos.</td></tr> </table>	10R	5.2 amp.	1Nos.	20R	2.7 amp.	1Nos.	50R	4.1 amp.	1Nos.	296R	2.8 amp.	1Nos.	190R	3.3 amp.	2Nos.	
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190R	3.3 amp.	2Nos.															
34	K.W. Meter 0 to 1 k.w. capacity	1															
35	Tong tester (Clip on meter)	1															
36	Lamp bank for loading up to 10 A 250 x	1															

37	Test lamp	4
38	Mallet hardwood 0.50 kg.	2
39	Hacksaw frame 200 mm. 300 mm. adjustable.	2
40	Try square 150 mm. blade.	1
41	Pliers flat Nose 100 mm. (Insulated)	2
42	Pier round Nose 100 mm. (Insulated)	2
43	Drill set 3 mm., 5 mm. 6 mm.	2
44	Wire gauge Imperial	2
45	Soldering Iron, 125 watt , 65 w	1
46	File half round , bastard 8 ”	2
47	Hand Vice 2” jaw	2
48	Magnet bar	1
49	Magnet horse shoe	1
50	Compass Magnetic needle	2
51	Stock and digs conducts (1/2 ”, ¾”, 1”)	2
52	Voltmeter M.C.O. 500 V.D.C. (Box type)	1
53	Ammeter M.C.O. 15 A.D.C. (Box type)	1
54	Ammeter M.C.O. - 5 A.X.C.	1
55	A.C. Voltmeter M.I.O. 500 V	1
56	A. C . Ammeter M.I.O. 75 A	1
57	A. C. Ammeter M.I.O. 5 A	1
58	Magger 500 volts.	1

59	A. C. Energy meter single phase 5A 250V	2
60	Bench Vice 5'	2
61	Bench working 2.5 x 1.20 x 0.75	2
62	Almeria 2.5 x 1.20 x 0.50 meters	1
63	Instructor 's table (3' x 2' x 2 ½ ')	1
64	Instructor 's chair.	1
65	Fire extinguishers	2
66	Fire Buckets	4
67	Copper bit soldering iron ½ lb.	1 set.
68	Series type Ohm- meter 0.2000 app.	1
69	Shunt type Ohm - meter 0.25 app.	1
70	Pipe vice to take pipes up to 2" dia.	2

GENERAL MACHINERY

1.	Motor A.C .squirrel cage 3 phase 400 volt 50 cycles 2 to 3 H. P. with star - delta starter and triple. Pole iron - clad switch ruse.	1
2.	Motor A.C. phase wound slip ring type 5 H.P. 400 volts 3 phase, 50 cycle with starter and switch.	1
3.	Motor A.C. Single phase 230 volt 1 H.P. repulsion type complete with starter switch .	1
4.	Motor A.C. single phase 230 volt 1 H.P. repulsion type complete with starter Switch.	1
5.	Motor A.C . single phase 230 volts, 50 cycle , capacitor type with starter switch 1 H.P.	1
6.	Motor universal 230 volt , 50 cycles with starter/ switch, 1 H.P.	1 No.
7.	Ceiling Fan 48"	1 No.
8.	Hot Plate 2 KW. 250 V.	1
9.	Geyser simple plate Kitko	1

10.	D.C. Compound motor	1
11.	Mixer Grinder Small type	1
12.	Table fan	1
13.	Electric Ins.	1 No.

REFERENCE BOOKS

- | | |
|---------------------------------|---------------------|
| 1) SUBODH VIDYUTSHAstra | BY TRAMBAK WAGHMARE |
| 2) ADHUNIK VIDYUTSHAstra | BY PRAKASH SHAHA |
| 3) BASIC ELECTRICITY | BY M L ANWANI |
| 4) SOPE VIDYUTSHAstra | BY SHAM PITKE |
| 5) BASIC ELECTRICAL ENGINEERING | BY P S DHOGAL |

*****THE END *****