

MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI

1	Name of Syllabus	C. C. In AUTO ELECTRICIAN (302101)																																								
2	Max.Nos of Student	25 Students																																								
3	Duration	6 Month																																								
4	Type	Part Time																																								
5	Nos Of Days / Week	6 Days																																								
6	Nos Of Hours /Days	4 Hrs																																								
7	Space Required	Workshop = 300 Sq feet Class Room = 200 Sq feet TOTAL = 500 Sq feet																																								
8	Entry Qualification	8 th Pass																																								
9	Objective Of Syllabus/ introduction	1. Trainee should be well know with tools, generally used for Repair & Maintenance of Automobiles. 2. Trainee should know the working as an Auto Electrician. 3. Trainee should be able to detect the electrical faults in vehicle. 4. He should know the electrical maintenance of the Automobile.																																								
10	Employment Opportunity	Self-Employment :- At the of the course the student will be equipped with knowledge and skills to set up his own Business as Auto Electrician. Wage-Employment :- On completion of Course, the student will be able to take up Job in Automobile repair shops.																																								
11	Teacher's Qualification	Diploma in Automobile Engineering. OR ITI / N.C.T.V.T. in Mechanic (Motor Vehicle) Trade /ELECTRICIAN Vocational Technician in the Trade of Auto Engineering Technician . OR Passed Auto Electrician Certificate Course of M.S. Board of Vocational Examination and Minimum 3 Year's Experience																																								
12	Training System	Training System Per Week <table><tr><td>Theory</td><td>Practical</td><td>Total</td></tr><tr><td>6 Hours</td><td>18 Hours</td><td>24 Hours</td></tr></table>						Theory	Practical	Total	6 Hours	18 Hours	24 Hours																													
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13	Exam. System	<table><tr><td>Sr. No.</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>30210111</td><td>Auto electrician</td><td>TH-I</td><td>3 hrs</td><td>100</td><td>35</td></tr><tr><td>2</td><td>30210121</td><td>Basic Electricity</td><td>PR-I</td><td>3 hrs</td><td>100</td><td>50</td></tr><tr><td>3</td><td>30210122</td><td>Study of Component</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. No.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Min. Marks	1	30210111	Auto electrician	TH-I	3 hrs	100	35	2	30210121	Basic Electricity	PR-I	3 hrs	100	50	3	30210122	Study of Component	PR-II	6 hrs	200	100			TOTAL			400	185
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AUTO ELECTRICIAN

SYLLABUS :

THEORY – I, AUTO ELECTRICIAN

Safety Precautions :- Introduction to safety precautions – Personal Safety, Machine Safety, Work Safety, Floor Safety, Electrical Safety. Elementary first aid and treatment for electrical shocks, burns, etc. Use of fire fighting equipments.

1. **Reading of Engineering Drawing :-** Learning the use of Drawing Instruments. Different types of lines and their usage, proportionate sketching of various electrical components used in Auto Engineering. Free hand sketching of different type of nuts, bolts and washers. Sketching and reading of various electrical systems, used in Auto Engineering such as lighting system, Turn signaling, brake light system, Indicator system, horn system, generating system.
2. **Signs & Symbols :-** To learn and sketch various electrical components and accessories used in Auto Engineering as per I.S.I. such as alternator, generators, magnetos, rectifiers, regulators, battery, ignition cell, capacitor, points, spark plug and electrical ignition components etc.

COMMON HAND TOOLS AND EQUIPMENTS

Name of tools, description and use, care and maintenance :- Combination Plier, Spanner Nose Plier, Slide Cutting Plier, Screw Driver, Electrician's knife, Test lamp, Hand Drill Machine, ordinary Copper Bit Soldering Iron, Electric Soldering Iron, Melting Pot, Blow Lamp and Crawler

3. **Basic Electricity :-** What is electricity ? What are the sources of electricity ?, What are the effects of electric current ?, Definition of Voltage, current & resistance and Units, Ohm's law, simple examples of ohm's law, Properties of series Circuit, simple examples of series circuit, simple examples of parallel circuit, Simple compound circuit, Examples of simple compound circuit, Define work, power, energy units and application, Open circuit, closed circuit & Short circuit.
4. **Primary & Secondary Cell :-** Arrangement of cell, Internal resistance of a cell, Cells in series, Cells in Parallel Cells in series Parallels, Electrolysis, Faraday's law of electrolysis, Types of Secondary Cells – Volta's Cell Daniel Cell, Laclanche cell, Dry cell and standard cell,. Types of Secondary Cells, Lead Acid Cell, Alkaline cell, Chemical changes of the secondary cell, Plate formation, Methods of charging.
5. **Method of Charging of a New Battery :-** Charging equipment, Types of charging, Battery Testing Equipment, Testing of Battery.
6. **AC & DC Generator :-** Introduction to magnetism, Types of magnets, Magnetic properties, Electro Magnetism & types of electro magnetic induction, Faraday's law of electro magnetism, E.M.F. induced in a conductor, Fleming's Right Hand rule, Fleming's Left Hand rule, Parts & Construction of dynamo.

Working Principle of D.C. Generator, Classification of DC Machines & it's use with circuit diagram, Working principle of AC Generator, Parts of an alternator, Types of alternators used in circuit diagram.

7) ACCESSORIES :- lead Acid Battery 6 – Volt, 12 – volt, Starter Motor Assembly, Solenoid Switch Assembly, Alternator Assembly, Cut-out, Ampere Meter, Horn Assembly, Horn Relay, Horn Button, Head Light Assembly, Upper Dipper Switch, Head Light Button / Switch, Ignition Cell, Distributor Assembly, Ignition Switch, Spark Plug, Parking Light Assembly, Indicator Light Assembly, Toggle Switch, On/ Off Switch, One way, on/off Switch, Two way, Brake Light Assembly, Brake Light Switch, Wiper Motor Assembly, Fuel Gauge, Tank Unit Assembly, Temperature, Gauge, Warning Lamp Assorted Colour, Dome Light Bulb Assembly, Heater Plug, Glow Plug, Heater Button, Electrical bulb, Single Filament Single Contact Bulb, Double Filament Double contact Bulb, Double Contact Single Filament Bulb, Junction Box Assembly, Battery Terminals, Wire Assorted Size, Wire Lug.

8) Basic knowledge of I.C. Engine (Petrol & Diesel) related to electrical system only.

9) IGNITION SYSTEM :- Spark Ignition, Battery Ignition, Magneto Ignition system, Electronic Ignition system.

Components – Use, Care Maintenance :

- a. Ignition Switch, Coil, Primary & Secondary Winding, Condenser, Contact Breaker Point, Distributor, Spark Plug.
- b. Electronic circuits and their components.

Ignition System – Testing :

D.C. Generator – Dynamo.

Principle :

To Teach :- Details of Working Control Unit, Regulator, Cut-out etc., Use, care & Maintenance, Alternator working Advantages, Details of parts, construction.

10) AUTOMOBILE ELECTRICAL SYSTEM :- Electrical System Battery 6 – Volt, 12- Volt, Ignition System – a. Battery Ignition, b. Magneto Ignition charging system, Starting System, Magneto System, Lighting System, Electronic System, Transistorized, Auxiliary system (Electrical).

11) LIGHT SYSTEM :- Electrical Accessories, Head Light, Side & Tail Lights, Brake Warning Lights, Indicator Lights, Ignition Warning lights, Interior Lighting, Electrical horn, Wiper meter, Electrical Fuel Lamp, Fuel Gauge, Temperature Gauge etc.

12) TESTING & MEASUREMENT TOOLS :

Description & Use, Care & Maintenance.

Voltmeter, ammeter, Ohmmeter, Multimeter, Wattmeter, Energy meter, Megger, Frequency, Galvanometer, Hydro Meter, High rate Battery Cell Tester.

13) Electrical system :-

Primacy & Secondary Cell, Lead Acid Battery: description, construction. Common trouble and remedy, Description of electrical circuit, Ignition system, and the components, Purpose, of Induction cell, condenser Spark Plug, Common trouble in Ignition Circuit & Remedy, Description of charging circuit, Operation of Dynamo and Construction; details of starter motor sole noised switches; common trouble and remedy. Description of lighting system and circuit, different components in lighting system, description and function of pre-focused bulb and sealed beam fuses and their importance. Electric horn system and circuit description of electric horn; operation of relay and horn switches; common trouble and remedy, Description & Operation of electric wiper motor : Care and maintenance common trouble in Indicator system, advantages of 12 volt system of wiring over 6-volt systems; Positive and negative earthing of battery; advantages and precautions, function and advantages of alternator, the fuel level indicator, oil pressure indicator, engine temperature : operation & function, description of auto wiring, harness wiring, types of wiring used in car & truck.

14) FAULT FINDING & REPAIRING OF FOLLOWING :-

Battery, Generating System, Generator charge at a low rate, Generator continues to charge at a high rate alternator is noisy when is operation, Starting Motor - Starting Motor does not turn to crank the engine; Starting Motor spins but does not crank the engine, Over running the clutch drive Ignition system – high resistance r open circuit, primary current too high, Breaker point Burn Rapidly, Spark Plug failure, Distributor, Ignition System, Lighting system-Electric bulb giving less light; Increase or decrease of light in moving vehicle, no lights, Blowing of fuses.

Practical - I - Basic Electricity

- 1) To measure the gauge of wire with the help of standard wire-gauge.
- 2) To make a straight joint of a given wire (1/18, 3/18, 7/18 P.V.C. Wire) or equivalent.
- 3) To make a 'T' joint of a given wire (1/18, 3/18, 7/18 P.V.C. Wire) or equivalent.
- 4) To make a Western Union of the given Conductor – Straight & T.
- 5) To make Britannia Straight & T joint of a given bare conductor.
- 6) Soldering Practice of the above joint.
- 7) To make a Lug joint.
- 8) To make a crimping joint of the given wire.
- 9) To test the phase & neutral by the test lamp & neon tester.
- 10) To test the earth tester.
- 11) To identify the terminal of AC & DC supply.
- 12) To measure the current by Ammeter.
- 13) To measure the voltage by voltmeter.
- 14) To measure the power of heater by Voltmeter & Ammeter.
- 15) To make a series connections of the given lamps and prove the properties.
- 16) To make the parallel connection of the given lamps and prove the properties.
- 17) To make the series and parallel connections of the given lamp.
- 18) To make circuit & rectify the fault of open circuit, Close Circuit & Short Circuit.
- 19) To study the internal constructions of Dry cell & Standard cell.
- 20) Measure the voltage of the given cell by voltmeter.
- 21) To make series connections of the cell & measure the voltage & current.
- 22) To make the parallel connections of the cell & measure V & I.
- 23) To study the internal construction of the secondary cell & Lead Acid cell.
- 24) To study the internal construction of the alkaline cell.
- 25) To measure the internal resistance of the battery.
- 26) To measure the terminal voltage of the given battery by high rate discharge tester and hydrometer of specific gravity.
- 27) Trace out the current of the metal rectifier battery charger.
- 28) Connection of battery with battery charger.
- 29) Testing battery (Symptoms & Battery charging & discharging).
- 30) Study the part of dynamo.
- 31) To study series, shunt & compound D.C. Machine.
- 32) To dismantle and study the parts of Alternator.
- 33) To study the working principle of alternator.
- 34) To study the connection of Alternator.

Practical - II - Study of component

- 1) Practicing all hand tools and measuring instruments.
- 2) Demonstration in the use of Hydrometer high rate battery cell tester and growler.
- 3) To study the construction, working and details of maintenance of distributor assembly; L.T. Circuit & H.T. Circuit.
- 4) To draw the circuit diagram of the Ignition system and Lighting system.
- 5) To prepare mock layout of wiring of Two wheeler, three wheeler & Four wheeler.
- 6) To service ignition circuit of two wheeler.
- 7) To service ignition circuit of Fiat-Car, Ambassador-Car, Maruti -Car & Other Cars & Truck.
- 8) To dismantle a used battery; to know the internal construction of battery plate groups battery separators.
- 9) To dismantle distributor and study its parts.
- 10) To dismantle generator, test the armature and coils on growler machine and report the conditions.
- 11) To test the ignition coils gap and test it on spark – plug tester.
- 12) Clean spark – plug, adjust gap and test it on spark – plug tester.
- 13) To test a lighting system – Head light, side light, sparking light, brake light etc.
- 14) To check all Electrical Circuit.
- 15) To clean and top up of a Lead Acid Battery : Testing battery with Hydrometer cell tester; connection a battery to charger.
- 16) To study electrical system circuit in the Engine assembly. Ignition circuit, Distributor assembly Ignition coil.
- 17) To remove Dynamo / alternator from vehicle; dismantling & cleaning, testing dynamo / alternator and fitting to vehicle.
- 18) To remove starter motor from vehicle & overhauling it, testing of starter motor.
- 19) To study the lighting system; Test Bulb of head lamp, find out short & open circuit in the light wiring; testing tail light and fuses.
- 20) To remove and electrical horn from vehicle. Dismantling, cleaning point and adjusting the horn for correct sound. Repairing of horn relay and horn switches.
- 21) To remove wiper motor, dismantling, cleaning, inspecting, repairing electrical wiper motor assembly & fitting; setting blades.
- 22) To study the wiring circuit of traffic Indicator tracer, defect in Indicator or System; replacing bulb and fuses.
- 23) To dismantle, clean & test Generator / Alternator : over hauling of Generator / Alternator; Adjusting fan belt.
- 24) To study repair of Indicator accessories; fault finding in Indicator accessories.
- 25) To study diagnosis of trouble and their remedies in Auto Wiring, Horness Wiring.
- 26) To study of computerized processor unit (C.P.U.) or computerized condensed Distribution and Ignition (C.D.I.) and sencer.
- 27) Testing, Fault & finding of electronic accessories mentioned above.
- 28) To study of transistorized ignition system.
- 29) Fault finding in electrical system two / three wheelers.
- 30) Fault finding in electrical system Four wheeler.

NOTE :- 1) During Practical examination, the student will do two practicals, one from practicals based on Paper-I and other one from Practical based on paper-II.

2) The practical will be allotted to students by external examiner. There shall be no printed paper from Exam Board's Office.

3) Equipments and Tools for Electronic practical shall be arranged by the Institution locally.

LIST OF TOOLS AND EQUIPMENTS.

Sr No	Name Of Tools and Equipments.	Qty
1	Double ended Spanner (Metric size) 8 to 32 min.	2 Sets
2	Double ended Spanner (RFS size) 9 to 25 min.	2 Sets
3	Double ended Spanner (8 to 32 min.)	2
4	Adjustable Spanner 20Cm.	2
5	Spark plug Spanner 14mm.	2
6	Spanner, Socket Set of 8	2
7	Spanner T. Flex for screwing up and unscrewing in non-accessible position.	1
8	Allen Key Set, Metric	1
9	Allen key Set, Inch Size	2
10	Nose Plier (Straight & Round)	2
11	Cir-clip Plier	1
12	Combination Plier, 15 Cm.	2
13	Pipe Wrench, 30 Cm.	1
14	Screw drivers of 6 different sizes	2 Sets
15	Torque Wrench, 0 to 67.5 kgm.	2
16	Stud Extractor	1
17	Hammer ball pin, 0.75 kg	1
18	Sledge Hammer and Flatter	1
19	Mechanical jack (5 tons)	2
20	All Types of two wheeler, three wheeler and Four wheeler	1 No. each
21	Electronic equipments to above vehicles wherever necessary	1 No. each
22	Hammer ball pin, 0.75 kg	3
23	Hammer cross pin, 0.75 kg	3
24	Hammer ball pin, 2.00 kg	3
25	Chisel cold flat, 19mm	3
26	Chisel half round, 9mm	3
27	Chisel cold cross-cut 9 X 3 mm	2
28	Hammer Plastic, 500gm.	2
29	Hammer Copper, 1 Kg.	1
30	Hacksaw frame adjustable for 20-30 cm. blades.	2
31	Centre punch, 10 cm.	2
32	Steel rule 15 cm English and Metric.	2
33	Steel rule 100 cm English and Metric.	1
34	Hand Brace ¼"	1
35	Bench Vice 5"	3
36	Vice jaw Clamp	1
37	File flat 18" 10% rough, 2 nd cut smooth	2
38	File half round 10" rough 2 nd cut	2
39	File triangular 10" 2 nd cut smooth	2
40	File round 10" 2 nd cut smooth	2
41	Scraper flat	2
42	Scraper half round	2
43	File Brush	2

MEASURING INSTRUMENTS AND INSPECTION EQUIPMENTS

Machines & Equipments

1.	Blow Lamp	1
2.	Cleaning Brush	1
3.	Painting Brush	1
4.	Surface Grinder, Medium Size	1

ELECTRICAL ITEMS

5.	Heater	1
6.	Solder Iron	2
7.	Inspection Lamp	2
8.	Electrical Wire 50 mtr.	50 Meters
9.	Insulation Tape	3 Rolls
10.	Growler	1 No.
11.	Soldering Flux	1 Packet
12.	Voltmeter DC 25 Volt	1 No.
13.	Ammeter	1 No.
14.	Hydrometer for Battery	
15.	High rate discharge test for battery	1
16.	Batter Charger	1
17.	Electrical Accessories	
i.	Electric Horn	1
ii.	Horn Relay	1
iii.	12 V. Head light side beam	1
iv.	Electric Bulbs	
a)	12 V Double Contract Double Filaments	2 Nos.
b)	12 V Double Contract Single Filaments	5 Nos.
c)	12 V Single Contract Single Filaments	5 Nos.
d)	12 V Dash Board Bulb 3 W.	5 Nos.
v.	Electric 12 V Flasher Unit	1
vi.	Electric Wiper Unit	1
vii.	Electric Feed Pump S.V. or Auto Pulse.	1
viii.	Static Carburetor of car and Scooter.	1 Each
18.	Coil & Condenser Tester.	1
19.	Spark Plug Cleaning and Testing Machines	1
20.	Ignition Distributor.	1
21.	Drill Twist Metric 3 NM x to 12 MM x 1MM	2 Sets
22.	Taps and dies, Complete set in box	2 Sets
23.	HSS Hand Reamer or Parallel Shank 7.5 to 12 mm by 1.5 mm.	1 Set
24.	HSS Hand Reamer Taper Pin 7.5 to 12 mm by 1.5 mm.	1 Set
25.	HSS Hand Reamer Taper Pin 7.5 to 12 mm by 1.5 mm.	1

Safety Equipments.

26.	Rubber Apron	2
27.	Fire Extinguisher (Foam Type)	1
28.	Sand Bucket	4
29.	Burrier Cream 250 gm.	1
30.	First Aid Box	1

REFERENCE BOOKS

- 1) Manufacturer's Printed Workshop Manuals, Wall Charts etc.
- 2) Maintenance Repair and Service Two wheeler by R.V. Bryant.
Pub : S. Chand & Co., New Delhi.
- 3) Moped Repair Hand Book By Paul Dempsey TAS BSK Blue Ridge Simmit PA. 4) Automotive Maintenance and trouble Shooting By Venk & Spices Pub : Tat McGraw Hill. 4) Automotive Electrical System By H.E. Ellenger D.B. Taraporewala & Sons, Bombay
- 5) Automotive Electrical Equipment By Young & Griffith, Illeffe & Sons.
- 6) Automobiles Electrical Maintenance By A.W. Judge, Pitman Publishing House.
- 7) Automotive Electrical maintenance Suspension, steering By Alignment & Brab.
By J.E. Billet, D.B. Taraporewala & Sons
