#### **030 – AUTOMOBILE ELECTRICAL WORKS**

#### **EXAMINATION STRUCTURE**

The trade consists of the following related courses:

191 - Metal Work

193 - Building/Engineering Drawing.

194 - Basic Electricity

The trade shall also be examined under the following components or subject grouping.

031 - Basic Motor Vehicle Technology, Batteries Charging and Maintenance (CAE 11, 12, 13, 14 & 15)

032 - Auto Battery Charging Wiring/Lighting, and Accessories (CAE 16 & 17)

### EXAMINATION SCHEME

#### 31 - Basic Motor Vehicle Technology

This subject grouping consists of two papers:

31-1	– PAPER I :	This will consists of two sections, viz Section A (Objectives) and Section B (Essay).
		<ul><li>SECTION A: will comprise forty (40) multiple choice objective questions to be answered in 40 minutes. This section carries forty (40) marks.</li><li>SECTION B: will comprise seven Essay questions and students are to answer five</li></ul>
		questions in $2\frac{1}{2}$ hours. This Section carries sixty marks.
31-2	PAPER II:	This will comprise of two Practical questions for 3 hours. This paper will attract 100 marks.

#### 32 - Auto Battery Charging Wiring/Lighting, and Accessories

This subject grouping consists of two papers i.e. Papers I and II

32-1 – PAPER I : This will comprise of forty (40) multiple choice objective questions to be answered in 40 minutes. This paper carries forty marks.

32-2 – PAPER II: This will comprise of seven Essay questions and students are to answer five questions in 2 hours. This paper carries 60 marks.

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
1.	Engine Layout	1. Principle components/system of a motor	1. Examine 2/4 stroke-cycle
	1. With the aid of a	vehicle	engine.
	diagram, explain the	2. Principles operation of 2/4 stroke-cycle	2. Dismantle, examine and
	working principles,	engines.	identify the main parts
	operations of 2/4 stroke-	3. Block diagram of 2/4 stroke-cycle	position of a cylinder
	cycle engines and give	A Simula form radia dan angina	engine from the piston to
	that use these principle	4. Simple four cylinder engine.	Crank shart.
	that use these principle.	5. Closs-Sectional view showing the main	3. Explain the need for the
		grankshaft	cylinder in an automobile
		6 Need for the use of more than one	State the differences
		cylinder in an automobile, cylinder	between single and multi-
		engine. Types and functions of niston	cylinder engines
		rings and gudgeon pin	cynnaer engines.
2.	Cooling System	1 Functions of cooling system in an	1 Interpret schematic
	1. With the aid of	automobile.	diagram of a cooling
	schematic diagram,	2. Cooling methods schematic diagrams	system showing:
	describe various cooling	showing:	i. air cooling
	systems.	i. air cooling	ii. water cooling
	2. Describe the action of	ii. water cooling	2. Identify automobiles that
	the water pump and	3. a) Types of automobile that use:	use:
	thermosyphon cooling	i. air cooling	i. air cooling
	element in an auto-	ii. water cooling	ii. water cooling
	cooling system.	b) Advantages of one system over the	3. Examine and identify the
		other	cooling systems.
		4. Concepts of simple thermosyphon	4. Examine and identify
		cooling element.	thermo system cooling
		5. Principle of operation of a water pump in	element.
		an auto cooling system.	
3.	The Transmission System	1. Transmission system in an automobile	Dismantle the transmission
	Identify the main units of an	functions.	system of an automobile and
	automobile transmission	2. Functions of main units of an automobile	examine the different units e.g.
	system and describe their	transmission system:	clutch, gear, propeller, drive
	functions.	1. Clutch	snafts, final drive etc.
		iii Propeller	
		iv Drive shafts	
		v Final drive	
4	Fuel Sunnly System	1 Function of fuel (netrol) system in an	
т.	Draw a schematic diagram and	automobile engine	
	explain the functions of the	2 Dismantle a mechanical/electrical fuel	
	fuel (petrol) system in an	pump and identify its various parts.	
	automobile engine.	3. Schematic diagram of fuel system	
		showing main units and their functions.	
		i. Indicator	
		ii. Tank and float unit	
		iii. Fuel pump	
		iv. Fuel filter	
		v. Carburetor	
		4. Block diagram of a fuel (petrol) system	
		showing:	
		i. Float unit	
		11. Fuel pump (electrical and	

# **031 – BASIC MOTOR VEHICLE TECHNOLOGY**

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
		mechanical) and carburetor	
5.	<b>Braking System</b> Enumerate the types, identify and state the functions of the braking system in an automobile.	<ol> <li>Functions of the brake in an automobile.</li> <li>Types of braking systems.</li> <li>Schematic diagram of the braking system.</li> <li>Functions of the main units of the braking system.</li> </ol>	<ol> <li>Discuss different types of braking system.</li> <li>Interpret schematic diagrams and identify the main units of the braking system.</li> <li>Demonstrate how to install a starter motor unto a vehicle and test for normal working.</li> </ol>
6.	<ol> <li>Coaxial Type Starter Motor         <ol> <li>Bench test axial type starter motor with bench testing machine.</li> <li>Dismantle, service reassemble and test coaxial type starter motor noting the relative positions of its compound parts for normal operations.</li> </ol> </li> </ol>	<ol> <li>Bench testing coaxial starter motor using:         <ol> <li>Stall test</li> <li>No load test</li> <li>Dismantling of coaxial type starter motor noting the relative positions of its component parts.</li> </ol> </li> <li>Testing starter motor components using:         <ol> <li>Armature coil open circuit/ground test</li> <li>Brush continuity test.</li> <li>Field coil continuity test.</li> </ol> </li> <li>Servicing of coaxial starter motor including:</li> <li>Principles of operation of a solenoid circuit.</li> </ol> <li>Servicing the starter solenoid by:         <ol> <li>dismantling starter solenoid ii. clean and replace badly pitted iii. contact point of the solenoid iv. testing solenoid winding for continuity.</li> </ol> </li> <li>Coaxial motor drive reassembling.</li>	<ol> <li>Demonstrate how to bench test a coaxial starter motor using stall test, no load test etc.</li> <li>Demonstrate how to dismantle coaxial type starter motor and note the relative positions of its component parts.</li> <li>Diagnose and test a faulty starter motor using the:         <ol> <li>armature coil open circuit test.</li> <li>Armature coil short, circuit/ground</li> <li>Brush continuity test etc.</li> </ol> </li> <li>Show how to service a coaxial starter motor.</li> <li>Interpret the schematic diagram of a solenoid circuit.</li> <li>Demonstrate how to reassemble a coaxial motor drive.</li> </ol>
7.	Axial Starter Motor         1.       Bench test axial type starter motor.         2.       Trouble shoot/service axial starter motor	<ol> <li>Bench testing axial starter motor using:         <ol> <li>stall test</li> <li>no-load-test</li> <li>load test</li> </ol> </li> <li>Trouble – shooting and serving of axial starter motor by:         <ol> <li>Dismantling of axial starter motor</li> <li>Testing the armature, coil, brush and field coil.</li> <li>Dismantling, servicing, testing and reassembling the solenoid.</li> <li>Skimming armature commutator</li> <li>Bedding the brushes.</li> <li>Lubricating, reassembling and testing the serviced axial motor</li> </ol> </li> </ol>	<ol> <li>Demonstrate how to bench test axial starter motor using the following methods.</li> <li>Demonstrate how to trouble-shoot and service axial starter motor using the correct sequence including e.g. dismantling axial starter etc.</li> </ol>

S/N	TOPICS/OBJECTIVE	CONTENT		ACTIVITIES/REMARK
		for normal operation.		
S/N 8. 9.	Spring Starter         1.       Enumerate the precautions required in handling spring starter and explain the hazards involved in removing/dismantling them.         2.       Identify the tools for overhauling the spring starter and service a faulty one.         Starter Motor Types         Identify various types of starter motors and with the aid of a labeled diagram explain their operations and state their functions, and applications.	CONTENT         for normal operation.         1.       Spring starter removal hazards         2.       Safety precautions in handling spring starter.         i.       Significance of colour codes         ii.       Sequence in dismantling         iii.       Position or posture.         3.       Tools for overhauling spring starter         i.       Spring clamp         ii.       Roller ball inserter, sleeve etc.         4.       Servicing of faulty spring starter.         1.       Types of starter motors.         i.       axial/coaxial inertia         ii. pre-engaged       Punctions of the starter motor in a motor vehicle.         3.       Diagram of a starting system.         4.       Principles of operations of a starter motor.         5.       Principles of operation of:         i.       inertia         ii. pre-engaged         iii. pre-engaged         iiii. or-axial<	1.         2.         3.         1.         2.         3.         4.	ACTIVITIES/REMARK Examine and identify various tools used for overhauling spring starter. Demonstrate how to service a faulty spring starter. Emphasis the need for safety precautions in handling spring starters. Identify the axial coaxial inertia and pre-engaged starters in an auto electrical workshop. Dismantle and examine a starter motor in the auto- electrical workshop. Examine and identify the following types of starter motors. i. Inertia ii. Co-axial iii. Spring starter iv. axial Examine and identify different types of starter drives e.g. in board, out board, roller clutch, self indexing, ellipse.
	h	<ul> <li>iv. Self indexing</li> <li>v. ellipse</li> <li>8. Principles of operation of: <ol> <li>in board</li> <li>out board</li> <li>iii. roller clutch</li> <li>self indexing</li> <li>ellipse</li> <li>starter drives</li> </ol> </li> </ul>		
10.	<u>Repair and Maintenance of</u>	1. Tools and equipment used in the service	1.	Identification of different
	<ol> <li>Starter Motors         <ol> <li>Identification of the various tools and equipment used in the service and maintenance of a starter motor.</li> <li>Trouble shoot, dismantle, reassemble, install and test a starter motor for</li> </ol> </li> </ol>	<ul> <li>and maintenance of a starter motor.</li> <li>i. Screw drivers</li> <li>ii. Spanners (assorted)</li> <li>iii. Test lamp</li> <li>iv. Lathe machine</li> <li>v. Bench testing machine</li> <li>vi. Under cutting machine</li> <li>vii. Armature testing growler</li> <li>viii. Avometer etc.</li> </ul>	2.	types of tools and equipment used in the services and maintenance of a starter motor e.g. screw drivers, spanners, test lamp etc. Demonstrate how to trouble-shoot auto starting systems.

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
	normal conditions	2. Trouble shooting of auto starting system.	iv. visual inspection
		i. visual inspection	v. testing the battery
		ii. testing the battery with the	with the hydrometer
		hydrometer etc.	etc.
		111. test the starter motor with	3. Demonstrate with the use
		instrument	of appropriate tools how to
		iv. test the statter circuit with battery	starter motors, from
		3 Types of starter motors Removal by	vehicle
		correct techniques using safety	4 Emphasis should be laid
		measures	on safety measures
		4. Components of the starter motors.	5. Dismantle and repair the
		i. dismantling	component parts of a
		ii. repairs	starter motor noting the
		5. Methods of testing starter motor parts.	relative position of parts.
		i. armature growler test	6. Demonstrate the different
		ii. motor brush test for continuity	methods of testing starter
		6. Starter motor brushes – bedding.	motor parts.
		7. Armature shaft of a starter motor -	7. Demonstrate how to bed
		straightness.	starter motor brushes.
		8. Confectness of.	8. Demonstrate now to
		ii Drive-end bracket	of a starter motor
		iii Brushings for starter motor	9 Demonstrate how to re-
		III. Drushings for suiter motor	assemble component parts
			of a starter motor.
			10. Demonstrate how to
			bench-test starter motor.
11.	<b>Types of Batteries</b>	1. Purpose of battery in the motor vehicle.	2. Identify different types of
	1. Identify and name	2. Types of batteries – lead-acid.	batteries used in auto
	various types of batteries	3. Composition and description of:	electrical systems and
	commonly used for the	1. lead-acid batteries	accessories.
	supply of power to auto-	11. nickel-aikaine	3. Solve simple problems to
	accessories	4. Closs-sectional diagrams.	i Capacity
	2 Explain the term battery	i lead acid batteries	ii Charging rate
	capacity and name	ii. Nickel-alkaline.	iii. Efficiency in a battery
	factors that influence the	6. Battery capacity - ratings	4. Demonstrate how batteries
	capacity of batteries and	7. Factors influencing the capacity of	are connected in series and
	carry out calculations to	batteries:	parallel.
	determine them.	i. area of plate	
		ii. number of plates	
		111. volume of electrolyte	
		8. Simple calculation involving:	
		1. charging rate	
		ii. capacity iii efficiency	
		9. Battery connections	
		i. series	
		ii. parallel	
12.	Lead Acid Batteries	1. Materials, tools, instruments and	1. Examine and identify
	1. Name, identify and	equipment used for battery charging	different tools.
	describe the use and	testing and maintenance	Instruments and equipment
	operation of materials,	i. distilled water	used for battery charging,
	tools, instruments and	11. hydrometer	testing and maintenance.

S/N	TOPICS/OBJECTIVE			CONTENT	1	ACTIVITIES/REMARK
		equipment used for		iii. discharge tester etc.	2.	Discuss the safety rules to
		battery charging, testing	2.	Use/operation of:		be observed in a battery
		and maintenance.		i. distilled water		charging room.
	2.	List the hazards that exist		ii. dilute sulphuric acid	3.	Emphasize the hazards that
		in a battery charging		iii. hydrometer		exist in a charging room.
		room and state the safety		iv. hygrometer	4.	Emphasize the need to
		rules to be observed.		v. high rate discharge tester		observe safety rule in a
	3.	Apply, maintain and		vi. Battery charger etc.		battery charging room.
		state the purposes of	3.	Hazards in battery charging room:	5.	Demonstrate how to
		wears for working in the		i. Acid spillage		maintain the battery
		battery charging room		ii. Explosion		charging room.
		and name the protection		111. Electric shock	6.	Discuss the protection
		achieved.		iv. Burns		achievement of wearing
	4.	Apply various first aid	4	v. Toxic tume etc.		the rubber gloves, rubber
		treatment for accidents	4.	Safety rules.		apron, nose mask, rubber
		found in a battery	э.	Maintenance of the battery charging	-	boots and goggles.
		the rules for the	6	Working wears in a charging room:	1.	Emphasize the need to
		propagation of acid	0.	i Rubber		the charging room
		electrolyte to		ii Rubber gloves	0	Demonstrate how to test
		specification observing		iii Nose mask	0.	acid electrolyte with
		appropriate safety rules		iv Rubber boots		hydrometer
	5.	Describe various		v. Goggles etc.	9.	Demonstrate how to
		methods of charging a	7.	First aid treatment for:		determine the condition of
		battery and explain the		i. Acid spills		a lead-acid battery using
		charging and discharging		ii. Burns		the ammeter, voltmeter
		processes of the lead acid		iii. Electric shock		cadmium tester etc.
		batter.		iv. Cuts etc.	10.	Demonstrate how to
	6.	Determine the condition	8.	Preparation of acid electrolyte safety		connect batteries for
		of full charge of lead-		rules		charging.
		acid batteries.	9.	Preparation of acid electrolyte.	11.	Demonstrate how to set
	7.	Care for and maintain	10.	Acid electrolyte – Test with hydrometer		battery charger and how to
		lead-acid batteries.	11.	Temperature correction in preparation of		connect battery to charger.
			10	electrolyte	12.	Demonstrate how to
			12.	Charging and discharging processes of		ascertain the condition of a
			12	Ine lead-acid battery.	12	Dattery during charge.
			13.	i Constant current (series)	13.	methods of determining
				ii Constant voltage condition		the condition of fuel
				Determine using		charge of batteries
				a ammeter	14	Demonstrate how batteries
				b. voltmeter, cadmium tester	11.	are disconnected from
				c. high rate discharge tester etc		charger after charging.
			14.	Battery connection.	15.	Demonstrate the caring
			15.	Battery connections to charger.		and maintenance of lead-
			16.	condition of battery – ascertaining by:		acid batteries by removing
				i. visual inspection		usurpation on the battery
				ii. appropriate test		terminal parts and
			17.	Prevention of terminal corrosion.		surroundings etc.
				i. Visual inspection	16.	Methods of determining
				11. Hydrometer test		the condition of full charge
			10	111. Voltmeter test		of batteries.
			18.	Battery disconnection from charge after	17.	Demonstrate how to
			10	charging.		prevent terminal corrosion.
			17.	Caring and mannaning lead-acid		

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
		batteries.	
		i. removal sulphation on the battery	
		terminal parts and surrounding.	
		ii. Clean and dry the top and outer	
		surfaces of battery with appropriate	
		solvent drier.	
		iii. Repair/restructure of broken	
		terminal post etc.	
13.	Charging and Maintenance	1. Electrolyte composition of a nickel-	1. Demonstrate how to
	of Nickel Alkaline Batteries	alkaline battery	prepare electrolyte for
	1. Prepare and state the	2. Charging safety rules.	nickel-alkaline battery.
	composition of the	3. Preparation of electrolyte for nickel-	Show how to test for
	electrolyte used in	alkaline battery using appropriate	correct specific gravity of
	nickel-alkaline batteries	specification.	the electrolyte in a nickel-
	observing appropriate	4. specific gravity of nickel alkaline battery	alkaline battery.
	safety measures.	electrolyte.	2. Demonstrate how to
	2. Test nickel-alkaline	5. Charging and discharging processes of $a^{4}$	connect the nickel-alkaline
	battery electrolyte for	nickel-alkaline battery.	battery to a charger.
	correct specific gravity	6. Condition of a nickel-alkaline battery	3. Demonstrate how to test
	observing appropriate	using appropriate testing instrument	the condition of the nickel-
	safety measures.	7. connection of a nickel-alkaline battery to	alkaline battery during
	3. Carry out appropriate	charger.	charging.
	tests at intervals to	8. Condition of the nickel-alkaline battery –	4. Show how to test for full
	ascertain the conditions	ascertain during charging process	charge of batteries.
	of the nickel-alkaline	9. Conditions for full charge of batteries.	5. Examine and identify
	batteries during charging	10. Care/maintenance of nickel-alkaline	different tools.
	process.	batteries.	Instruments
	AUTO IGNITI	ON AND CHARGING SYSTEMS (CA	E 13 & 14)
14.	Coil Ignition	1. Battery type ignition coil.	1. Examine and identify the
	1. Identify, draw a	2. Functions of coil ignition system in an	battery types ignition coil.
	schematic diagram and	automobile.	2. Interpret the schematic
	explain the function of	3. Schematic diagram of the battery	diagram of the battery coil
	each component of the	ignition system.	ignition system.
	battery coil ignition	4. Functions of each component of the	3. Examine and identify the
	system.	following coil ignition system.	physical positions of the
	2. Identify the physical	i. Ignition Coil	components of the battery
	components, tools,	ii. Distributors	coil ignition system.
	instruments and	iii. Spark Plugs	4. Examine and identify
	equipment used for	iv. Connecting Wires	tools, instrument and
	maintenance and test of	v. Battery Switch etc.	equipment used for
	ignition system and state	vi. Ballast Resistor	maintenance and testing on
	their application.	5. Physical positions of the components of	the ignition system e.g.
	3. Trouble-shoot faulty	the battery coil ignition system.	Spanners, screw drivers
	ignition coil and carry	1. Ignition	etc.
	out static/dynamic	11. Distributors	5. Demonstrate how to
	ignition timing using test	iii. Spark plugs	trouble-shoot faulty
	lamp and stroboscope.	iv. connecting wires	component parts of an
		v. Dattery Switch etc.	appropriate
		vi. III all autoilloolle	tools/instruments
		vii. Contact Broaker	6 demonstrate how to test
		iv Cam	ignition output with the
1		IA. Calli V. Doton	test dwall welt tester
		X KOIOF	
		v Uoton	toot drught volt tostor

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
		coil ignition system.	stroboscope (time light) on
		i. fire	dynamic ignition timing.
		ii. burns	
		7. Tools, instruments and equipment used	
		for maintenance and test on the ignition	
		system.	
		i. spanners	
		ii. screw drivers etc.	
		8. Safety precautions when working on an	
		ignition system to prevent hazards like:	
		i. fire	
		ii. burns etc.	
		9. Trouble-shoot faulty component parts of	
		an ignition coil system using appropriate	
		tools/instruments for testing.	
		i. ignition coil open and short circuit	
		test with meggar.	
		ii. Condenser – correct reading with	
		condenser tester etc.	
		10. Test ignition output with the tack-dwell volt-tester	
		11 Static ignition timing using test lamp	
		12 Dynamic ignition timing using	
		stroboscope (time light)	
1.	Magneto Ignition System	1. Magneto ignition system.	1. Dismantle a mageto
	1. Identify, draw a	2. Schematic diagram of the magneto	ignition system and
	schematic diagram of the	ignition system.	examine/identify its
	magneto ignition systems	3. Difference between:	different component parts.
	and label its parts. Also	i. magneto system	2. Interpret schematic
	outline the main	ii. battery coil system	diagram of the magneto
	difference between the	4. Faulty magneto ignition system.	ignition system.
	magneto system and the	5. Maintenance of the magneto system.	3. Demonstrate how to
	battery coil system.	6. Coupling component parts of the	disconnect essential
	2. Diagnose, test clean up,	magneto.	components and diagnose
	adjust and repair each	•7. Ignition system.	faulty magneto ignition
	component of the	8. Magneto ignition output	system from the engine.
	magneto system and test	9. Static ignition timing using test lamp	4. Demonstrate how to
	the output with the	10. Dynamic ignition timing using	maintain the magneto
	appropriate instrument.	stroboscope	system.
			5. Demonstrate how to
			couple back different
			component parts of the
			magneto ignition system.
			6. Demonstrate how to test
			the magneto ignition
			output with appropriate
			instrument.
			/. Demonstrate how to carry
			out static ignition timing
			Using test lamp.
			o. Demonstrate now to carry
			timing using strobosoors
16	The Onus Distribution	1 Types of distributors:	1 Examine and identify
10.	1 Name and identify	i Double	different types of
1	white white is a factor of the second seco		and a show of the state of the

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK	
S/N	<ul> <li>TOPICS/OBJECTIVE</li> <li>various types of distributors and describe their principles of operation.</li> <li>2. Sketch and explain the operation of the vacuum advance unit and the centrifugal advance mechanism.</li> <li>3. Draw and label the schematic diagram of the OPUS current and remove/service the OPUS from the engine using a manual or a set of specific instructions.</li> </ul>	<ul> <li>CONTENT <ol> <li>Oscillating pick-up systems</li> <li>Principles of operation of the distributors.</li> </ol> </li> <li>Principle of operation of the vacuum advance mechanism.</li> <li>Principles of operation of the centrifugal advance mechanism.</li> <li>Vacuum advance unit for effective operation on engine-test.</li> <li>Centrifugal advance mechanism for effective operation-test.</li> <li>Centrifugal advance mechanism for effective operation-test.</li> <li>Adjustment of double contact distributors to specification using dwell tack meter.</li> <li>Schematic diagram of the OPUS circuit</li> <li>OPUS distributor – removal from engine.</li> <li>Servicing of OPUS distributor – using manual or specific instrument.</li> </ul>	<ul> <li>ACTIVITIES/REMARK</li> <li>distributors.</li> <li>2. Demonstrate how to test the vacuum advance unit for effective operation on the engine with appropriate instrument.</li> <li>3. Demonstrate how to test the centrifugal advance mechanism for effective operation.</li> <li>4. demonstrate how to adjust a double contact distributor to specification using the dwell tack-meter.</li> <li>5. Interpret the schematic diagram of the OPUS circuit.</li> <li>6. Demonstrate how to remove the OPUS distributor unit using a manual or specific</li> </ul>	
17.	Transistor Controlled/ Assisted Ignition System1. Identify the various types of transistor controlled assisted ignition system and explain the operation of each type.2. Enumerate the advantages of the transistor controlled/assisted ignition over the conventional ignition system and outline their main differences.	<ol> <li>Types of transistor controlled/assisted ignition system.         <ol> <li>contact controlled</li> <li>magnetic controlled.</li> <li>Transistor assisted ignition unit TAC4</li> </ol> </li> <li>Operation of each of the transistor controlled/assisted ignition system.</li> <li>Differences between battery coil ignition system and transistor controlled types.</li> </ol>	<ol> <li>instructions.</li> <li>Examine and identify the various types of transistor controlled/assisted ignition system e.g. contact controlled TAC4.</li> <li>Interpret schematic diagram of the:         <ol> <li>Negative earth system</li> <li>Positive earth system.</li> </ol> </li> <li>Demonstrate how to service transistor controlled ignition system using a manual or a set of given instruments.</li> </ol>	
18.	<ol> <li><u>The dynascope</u></li> <li>Identify a dynascope, showing its main features or controls and state their functions.</li> <li>Test engine efficiency with the dynascope and interpret the wave pattern observed on the dynascope to specification making necessary adjustments of the engine.</li> </ol>	<ol> <li>Controls and functions of a dynascope:         <ol> <li>on/off means switch</li> <li>oscilloscope controls-raster, pattern and super-imposed pattern.</li> <li>Voltmeter/armeter/chmeter controls.</li> <li>Capacity leakage test control</li> <li>Built in stroboscope etc.</li> </ol> </li> <li>Safety use of the dynascope – precautions</li> <li>Dynascope connection</li> <li>Engine efficiency using – dynoscope</li> <li>Dynascope wave pattern.</li> </ol>	<ol> <li>Examine and identify the main features or controls of a dynascope.</li> <li>Emphasize the precautionary measure for the safe use of the dynascospe.</li> <li>Demonstrate how to onnect the dynascope to the engine correctly for testing.</li> <li>Demonstrate how to test engine efficiency with the dynascope.</li> <li>Interpret wave pattern observed on the dynascope to specification.</li> </ol>	

<ol> <li><u>Ceneration of Electricity</u></li> <li><u>Induced current - definition</u></li> <li>Induced voltage - definition</li> <li>Induced voltage - definition</li> <li>Induced current and induced voltage - definition</li> <li>Induced voltage</li> <li>Isylain the electromagnetic principles of electricity generation of electricity with the aid of diagrams.</li> <li>Experiments and explain the generator is an automobie.</li> <li>Induced voltage system</li> <li>Induced voltage control of generators and identify the rating or size of each of the generators using the: interpole</li> <li>Induced voltage system</li> <li>Methods of roubte-shooting faulty charging system</li> <li>Induced voltage system</li> <li>Induced voltage system</li> <li>Induced voltage control of generator.</li> <li>Induced voltage system</li> <li>Induced voltage control in the system</li> <li>Induced voltage control of generator.</li> <li>Induced voltage system</li> <li>Induced voltage system</li> <li>Indu</li></ol>	S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
<ol> <li>Define induced control of the performant of low to generation and use laboratory experiments to the experiments in induced error and induced voltage - determine by laboratory experiment.</li> <li>State Lenz's haw and relate it to the experiments in an induced voltage.</li> <li>Explain the sequences in all automobile.</li> <li>Generation of the generator in all automobile.</li> <li>Identify various types of generator in all automobile.</li> <li>Name and explain three methods of output control of generators and explain their working principles.</li> <li>Detrice a given generators and explain the generator in all automobile.</li> <li>Name and explain three methods of output control generators.</li> <li>Detrice fully charging system.</li> <li>Detrice fully charging system.</li> <li>Detrice fully charging system.</li> <li>Methods of output control generators.</li> <li>Methods of output control generators and explain three methods.</li> <li>Faulty charging system.</li> <li>Polarize a given generator sand rewind armature control.</li> <li>Methods of output control generators.</li> <li>Faulty charging system.</li> <li>Vaual inspection for disconnections in the system situate voltage control.</li> <li>Namature reaction method.</li> <li>Faulty charging system.</li> <li>Stin armature control is methods in the system situate to wo to mount a generator to the control is correct tow to mount a generator to the control is correct tow to mount a generator to the control is correctly.</li> <li>Demonstrate how to sarta mengine ou</li></ol>	19.	Generation of Electricity	1. Induced current – definition	Demonstrate in the laboratory
<ul> <li>and use laboratory experiments to determine the distrators the different parts of an experiment.</li> <li>State Lenz's law and retrieved in duced current and induced voltage.</li> <li>Lenz's Law 1 Lenz's Law 5 Lenz's Law 3 Lenz's Law 1 Lenz's Law 5 Lenz's Law 4 Application of Lenz's law to induced current induced voltage.</li> <li>Explain the cleatromagnetic principles of generation of electricity generation of electricity with the aid of diagrams.</li> <li>Exercising</li> <li>Lenz's Law 5 Lenz's Lenz's Law 5 Lenz's Lenz's Law 5 Lenz's</li></ul>		1. Define induced	2. Induced voltage – definition	experiment on how to
<ul> <li>and use intoritativy experiments in diduced vertices working the induced area in the didentity working principles of electricity with the ad of diagrams.</li> <li>Explain the cleaterist of generation of cleaterist of an auto charging system.</li> <li>Factors governing the amount of current in an automobile.</li> <li>Functions of a generator. Diagrams</li> <li>Factors governing the amount of current in an automobile.</li> <li>Hentity variang principles.</li> <li>State the function of the generator on Diagrams of a generator on auto charging system.</li> <li>Name and explain three methods of output control generators.</li> <li>Polarize a given generators and repeater with agroentators and explain three methods of output control generators.</li> <li>Polarize a given generator and method.</li> <li>Methods of output control generators.</li> <li>Methods of output control generators in the system mature reaction using any system.</li> <li>Methods of output control generators.</li> <li>Methods of output control generators in the system in the system is mature reaction method.</li> <li>Methods of output control generators in the system is mature reaction with appropriate tools following governet is and field coll with appropriate tools following governet is and field coll with appropriate tools following governet is and field coll with appropriate tools following governet is and field coll with appropriate tools following governet is and field coll with appropriate tools following governet is and field coll with appropriate tools following governet is and field coll with appropriate tools follow with appropriate tools following governet with appropriat</li></ul>		current and voltage	3. Induced E. F. and potential, difference	determine:
<ul> <li>a finite control of the determine by laboratory experiment.</li> <li>State Lenz's law and electricity guerration – Diagrams.</li> <li>Explain the electromagnetic principles of electricity guerration – Diagrams.</li> <li>Factors governing the amount of current produced by a generator.</li> <li>Electromagnetic principles of generator in an auto charging system.</li> <li>Identify various types of generator in all auto charging system.</li> <li>Identify various types of generators and schlaim their working principles. State the function of the generator in all automobile.</li> <li>Name and explain three methods of output control of generators and schlaim there working principles. State the functions of a generator rating.</li> <li>Delock diagram of the following generators showing their physical features:         <ul> <li>Generator sand schlaim three methods of output control of generators and service fully charging system.</li> <li>Delock diagram of the following generator rating.</li> <li>Delock diagram of the following generator sand service fully charging system.</li> <li>Compensated voltage control in: compensated voltage system.</li> </ul> </li> <li>Faulty charging systems         <ul> <li>Workods of output control of generators.</li> <li>Methods of output control of generators.</li> <li>Methods of fortubile shooting faulty charging system.</li> <li>Faulty charging system.</li> <li>Now many regonary mature commutator explain the engine and field field on with appropriate tools following correct sa</li></ul></li></ul>		and use faboratory	(pd) - comparism	1. Induced current
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<ul> <li>2. State the function of the experiments in induced venering the automobile.</li> <li>2. Explain the experiments in induced venering the amount of current produced by a generator.</li> <li>2. Explain the experiments in an automobile.</li> <li>2. Ceneration Type Repair and automobile.</li> <li>2. Methods of the information of the generator in an auto charging system.</li> <li>2. Name and explain three methods of output control of generators and identify the rating or size of each type of generator.</li> <li>3. Detect, trouble shoot and service faulty charging system.</li> <li>4. Polarize a given generator and rewind armature rewinding machine method.</li> <li>4. Polarize a given generator and rewind armature rewinding machine method.</li> <li>5. Faulty charging system.</li> <li>6. Methods of output control of generators.</li> <li>6. Methods of output control.</li> <li>7. Faulty charging system.</li> <li>8. Methods of output control.</li> <li>7. Faulty charging system.</li> <li>8. Methods of output control.</li> <li>7. Faulty charging system.</li> <li>8. Methods of output control.</li> <li>7. Faulty charging system.</li> <li>8. Methods of output control.</li> <li>7. Faulty charging system.</li> <li>8. Methods of output control.</li> <li>7. Faulty charging system.</li> <li>8. Methods of output control.</li> <li>7. Faulty charging system.</li> <li>8. Methods of output control.</li> <li>7. Faulty charging system.</li> <li>8. Methods of output control.</li> <li>9. Faulty charging system.</li> <li>10. Visual inspection for disconnections in the system</li> <li>10. Wrist anspection for disconnections in the system</li> <li>10. Demonstrate Most os serve faulty charging system.</li> <li>11. Bernomstrate for the component.</li> <li>12. Faulty charging system.</li> <li>13. Remove the generator noting the relative positions of the component.</li> <li>14. Remove the generator from the engine of the automobile</li> <li>15. Wrist anspection for disconnections in the system an file doil with approprinte tools.</li> <li< th=""><th></th><th>2 State Long's law and</th><th>5 Long's Low</th><th></th></li<></ul>		2 State Long's law and	5 Long's Low	
<ul> <li>Control induced voltage: current violage.</li> <li>Explain the electromagnetic principles of generation of electricity with the aid of diagrams.</li> <li>Each of the electron agnetic principles of generation of electricity with the aid of diagrams.</li> <li>Concernation Type Repair and Servicing</li> <li>I dentify various types of generators and explain their working principles. State the function of the generators and explain their working principles. State the function of the generators and explain their working principles.</li> <li>Name and explain the generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of given given generator rating.</li> <li>Methods of output control of generators.</li> <li>Methods of output control of generators.</li> <li>Methods of output control of generators.</li> <li>Teally charging systems - service with appropriate tools following correct sequence:         <ul> <li>Now the segnerator from the engine of the automobile</li> <li>Now the generator noting the relative of size a generat</li></ul></li></ul>		2. State Lenz S law and	6 Application of Lanz's law to induced	
<ul> <li>Control induced current/voltage.</li> <li>Explain the electromagnetic principles of generation of electricity with the electricity with the electricity with the add of diagrams.</li> <li>Control of generators and explain three methods of output control of generator.</li> <li>I dentify various types of generator.</li> <li>I dentify various types of generators. State the function of the generators showing their physical features of a generator.</li> <li>I block diagram of the following generators.</li> <li>Detect, trouble shoot and service faulty charging system.</li> <li>Detect, trouble shoot and service faulty charging system.</li> <li>Detect, trouble shoot and service faulty charging system.</li> <li>Methods of output control of generators and rewind armature crewinding machine method.</li> <li>Faulty charging systems</li> <li>Current-voltage control</li> <li>Current-voltage control.</li> <li>Faulty charging systems</li> <li>Visual inspection for disconnections in the system.</li> <li>Faulty charging systems</li> <li>Wethods of rouble-shooting faulty charging systems.</li> <li>Faulty charging systems</li> <li>Wethods of rouble-shooting faulty charging system.</li> <li>Faulty charging systems</li> <li>Tradil and adjust fan belt to correct tension faulty charging system.</li> <li>Faulty charging systems</li> <li>Worket test for continuity and faulty components.</li> <li>Faulty charging systems</li> <li>Prauly charging systems - service with appropriate tools following correct sequence:</li> <li>Remove the generator from the engine of the automobile</li> <li>Dismantle to generator raing the relative positions of the componut.</li> <li>Test generator raing.</li> <li>Wethods of rouble-shooting faulty charging system.</li> <li>Demonstrate boy to serve faulty charging system.</li> <li>Demonstrate how to serve faulty charging system.</li> <li>Demonstrate how to serve faulty charging system instrument.</li> <li>With appropriate tools following correct sequence:</li> <li>Remove the generator manuture, prushes a</li></ul>		experiments in	current induced voltage	
<ul> <li>arrent/voltage.</li> <li>3. Explain the electromagnetic principles of eventery generation of electricity with the aid of diagrams.</li> <li>20. <u>Generation Type Repair and Servicing</u></li> <li>1. Identify various types of generators and explain their working principles. State the function of the generator in all auto charging system.</li> <li>2. Name and explain three methods of output control of generators and identify the rating or size of each type of generator.</li> <li>3. Block diagram of the following generators and identify the rating or size of each of the generator and service faulty charging system.</li> <li>4. Polarize a given generator.</li> <li>5. Methods of output control generators.</li> <li>6. Methods of output control generators.</li> <li>7. Polarize a given generator and in the system manture renthod.</li> <li>7. Polarize a given generator and in the system.</li> <li>8. Methods of output control generators.</li> <li>6. Methods of rouble-shooting faulty charging system.</li> <li>7. Polarize a given generator in the system</li> <li>8. Methods of rouble-shooting faulty charging system.</li> <li>9. Faulty charging system.</li> <li>9. Faulty charging system - service with appropriate tools following correct sequence: <ul> <li>1. Near the system in the system is reavice and faulty components.</li> <li>9. Faulty charging system - service with appropriate tools.</li> <li>9. Faulty charging system - service with appropriate tools of the automobile in Dismattle the generator noting the relative positions of the component.</li> <li>10. Demonstrate how to sart an engine and text a measure for more the system is strutter.</li> </ul></li></ul>		induced	7 Electromagnetic principles of electricity	
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<ul> <li>20. <u>Generation Type Repair and servicing</u></li> <li>21. <u>Generatorin Type Repair and Servicing</u></li> <li>22. <u>State the function of the generator in all automobile</u>.</li> <li>23. <u>State the function of the generator in all automobile</u>.</li> <li>24. <u>State the function of the generator in all automobile</u>.</li> <li>25. <u>State the function of the generator in all automobile</u>.</li> <li>26. <u>State the function of the generator in all automobile</u>.</li> <li>27. <u>Name and explain three methods of output control of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and identify the rating or size of each type of generators and its the functions of the different parts of an auto charging system.</u></li> <li>37. <u>Detect, trouble shoot and service faulty charging system</u></li> <li>4. <u>Polarize a given generator rating</u></li> <li>5. <u>Methods of output control of generators in the system in current-voltage control.</u></li> <li>6. <u>Methods of output control of generators in the system in the system in the system in twith appropriate tools following correct is in the system in the system in the system in the system in <u>Components.</u></u></li> <li>9. Faulty charging systems.</li> <li>9. Faulty charging systems.</li> <li>9. Demonstrate fifterent in the system with appropriate tools.</li> <li>10. Demonstrate down to serve faulty charging system in the system with appropriate tools.</li> <li>10. Demonstrate how to serve faulty charging system in the system with appropriate tools.</li> <li>11. Demonstrate how to nound in the system and field coil with appropriate tools.</li> <li>12. Demonstrate how to start an engine and test a mengine </li></ul>		3 Explain the	8 Factors governing the amount of current	
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<ul> <li>20. Generation Type Repair and Servicing</li> <li>1. Identify various types of generators and explain their working principles. State the function of the generator in all automobile.</li> <li>2. Name and explain three methods of output control of generators and identify the rating or size of each type of generator.</li> <li>3. Detect, trouble shoot and service faulty charging system.</li> <li>4. Polarizze a given generators and rewind armature rewinding machine method.</li> <li>4. Polarizze a given generators and rewind armature rewinding machine method.</li> <li>5. Methods of output control of generators.</li> <li>6. Methods of output control of generators.</li> <li>7. Faulty charging system</li> <li>8. Methods of output control of generators.</li> <li>6. Methods of routput control of generators.</li> <li>7. Faulty charging system</li> <li>8. Methods of routput control of generators.</li> <li>9. Faulty charging system</li> <li>i. Visual inspection for disconnections in the system</li> <li>ii. AVO meter test for continuity and faulty charging systems</li> <li>i. Visual inspection for disconnections in the system</li> <li>ii. AVO meter test for continuity and faulty charging systems.</li> <li>9. Faulty charging system.</li> <li>iii. Novener test for continuity and faulty components.</li> <li>9. Faulty charging system and faulty charging systems</li> <li>iii. AVO meter test for continuity and faulty charging systems.</li> <li>iii. Avo meter test for continuity and faulty charging systems.</li> <li>iiii. Bernator armature, bushes and field coli with appropriate tools following correct sequence: <ul> <li>iii. Test generator armature, bushes and field coli with appropriate tools following correct sequence:</li> <li>iiii. Test generator armature, bushes and field coli with appropriate thow to start an engine and test a meand ender test a meand and test a meand ender the start an engine and test a meand ender the start an engine and test a meand ender the start an engine and test a meand ender the start an en</li></ul></li></ul>		aid of diagrams.		
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<ol> <li>Identify various types of generators and explain their working principles. State the function of the generator in all automobile.</li> <li>Name and explain three methods of output control of generators and identify the rating or size of each type of generator.</li> <li>Block diagram of the following generators and identify the features:         <ol> <li>a Block diagram of the following generators and identify the features:                 <ol> <li>b dc. generator</li> <li>b ucking field</li> <li>c agnerators and service faulty charging system.</li> <li>Polarize a given generators and rewind armature coil to specification using armature rewinding machine method.</li></ol></li></ol></li></ol>		<u>Servicing</u>	automobile.	identify and re-assemble
<ul> <li>generators and explain their working principles. State the function of the generator in all autorobile.</li> <li>Name and explain three methods of output control of generators and identify the rating or size of each type of generator.</li> <li>Detect, trouble shoot and service faulty charging system.</li> <li>Detect, trouble shoot and service faulty charging system.</li> <li>Polarize a given generators and rewind armature rewinding machine method.</li> <li>Methods of output control of generators.</li> <li>Methods of output control of generators in the system</li> <li>Name and explain three methods of output control of generator.</li> <li>Detect, trouble shoot and service faulty charging system.</li> <li>Methods of output control of generators in Armature reaction method ii. Compensated voltage control iii. current-voltage control.</li> <li>Faulty charging systems – service with appropriate tools following correct sequence:</li> <li>Remove the generator from the engine of the automobile ii. Dismantle the generator from the engine of the automobile</li> <li>Dismantle the generator roting the relative positions of the components.</li> <li>Demonstrate how to serve faulty charging system – service with appropriate tools following correct sequence:</li> <li>Remove the generator from the engine of the automobile ii. Dismantle the generator noting the relative positions of the component.</li> <li>Demonstrate how to serve faulty charging system with appropriate tools.</li> <li>Demonstrate how to serve faulty charging system</li> <li>Demonstrate how to start an engine and test a</li> </ul>		1. Identify various types of	2. a) Functions of the different parts of an	the different parts of an
<ul> <li>their working principles. State the function of the generator in all automobile.</li> <li>Name and explain three methods of output control of generators and identify the rating or size of each of the generator rating.</li> <li>Detect, trouble shoot and service faulty charging system.</li> <li>Detect, trouble shoot and service faulty charging system.</li> <li>Generator rating.</li> <li>Methods of output control of generators.</li> <li>Methods of output control of generators.</li> <li>Methods of oruput control.</li> <li>Faulty charging systems <ol> <li>Visual inspection for disconnections in the system.</li> <li>Avo meter test for continuity and faulty components.</li> <li>Faulty charging systems - service with appropriate tools.</li> <li>Faulty charging systems - service with appropriate tools.</li> <li>Eatwanine and identify the physical features of a generator.</li> <li>Examine and identify the rating of size of each of the generators as listed on the body of the machine.</li> <li>interpole</li> <li>is armature reaction method</li> <li>Compensated voltage control.</li> <li>Faulty charging systems</li> <li>Visual inspection for disconnections in the system</li> <li>Nethods of trouble-shooting faulty charging systems.</li> <li>Paulty charging systems - service with appropriate tools following correct sequence:</li> <li>Remove the generator noting the relative positions of the component.</li> <li>Dismantle the generator noting the relative positions of the component.</li> <li>Demonstrate how to serve faulty charging system and field coil with appropriate instrument.</li> <li>With armature commutator effer</li> </ol></li></ul>		generators and explain	auto charging system.	auto charging system.
<ul> <li>State the function of the generator in all automobile.</li> <li>Name and explain three methods of output control of generators showing their physical generator.</li> <li>Block diagram of the following generators showing their physical features: <ul> <li>a. Block diagram of the following generators showing their physical features:</li> <li>a. d. e. generator in diadentify the rating of size of each of the generators and identify the rating of size of each of the generators and rewind armature coil to specification using armature rewinding machine method.</li> </ul> </li> <li>3. Detect, trouble shoot and service faulty charging system.</li> <li>4. Polarize a given generators and rewind armature coil to specification using armature rewinding machine method.</li> <li>4. Polarize a given generators and rewind armature coil to specification using armature rewinding machine method.</li> <li>5. Methods of output control of generators.</li> <li>6. Methods of trouble-shooting faulty charging systems <ul> <li>i. AVO meter test for continuity and faulty charging systems.</li> <li>i. AVO meter test for continuity and faulty charging system.</li> </ul> </li> <li>9. Faulty charging systems <ul> <li>i. AVO meter test for continuity and faulty charging system.</li> <li>i. Dismantle the generator rnoting the relative positions of the component.</li> <li>ii. Dismantle the generator rnoting the relative positions of the component.</li> <li>iii. Test generator armature, brushes and field coil with appropriate inistrument.</li> <li>iii. With appropriate for the automobile</li> <li>iiii. Dismantle the generator rnoting the relative positions of the component.</li> <li>iv. Skin armature commutator effertion and field coil with appropriate for the automobile</li> </ul> </li> </ul>		their working principles.	b) Schematic diagram of an auto	2. Examine and identify the
<ul> <li>generator in all automobile.</li> <li>Name and explain three methods of output control of generators and identify the rating or size of each type of generator.</li> <li>Detect, trouble shoot and service faulty charging system.</li> <li>Generator rating.</li> <li>Methods of output control of generators.</li> <li>Generator rating.</li> <li>Methods of output control of generators using the: <ul> <li>Armature reaction method.</li> </ul> </li> <li>Generator rating.</li> <li>Methods of output control of generators using the: <ul> <li>Compensated voltage control</li> <li>Compensate top family charging system</li> <li>Visual inspection for disconnections in the system</li> <li>AVO meter test for continuity and faulty charging systems.</li> <li>Faulty charging systems – service with appropriate tools following correct sequence:</li> <li>Remove the generator mature, brushes and field coil with appropriate instrument.</li> <li>With aparopriate how to start an engine and test a media mature form</li> </ul></li></ul>		State the function of the	charging system.	physical features of a
<ul> <li>automobile.</li> <li>Name and explain three methods of output control of generators and identify the rating or size of each type of generator.</li> <li>Detect, trouble shoot and service faulty charging system.</li> <li>Detect, trouble shoot and service faulty charging system.</li> <li>Polarize a given generators and rewind armature coil to specification using amachine method.</li> <li>Methods of output control of generators.</li> <li>Methods of output control of generators.</li> <li>Methods of output control of generators.</li> <li>Methods of output control of generators in the systems</li> <li>Armature reaction for disconnections in the systems</li> <li>Visual inspection for disconnections in the system</li> <li>AVO meter test for continuity and faulty charging systems – service with appropriate tools following correct sequence:</li> <li>Remove the generator from the engine of the automobile</li> <li>Dismantle the generator rating the generator.</li> <li>Remove the generator from the engine of the automobile</li> <li>Dismantle the generator mature, brushes and field coil with appropriate how to start an engine and test at on engine and test at on engine and test at on engine and test at an engine and te</li></ul>		generator in all	3. Block diagram of the following	generator.
<ol> <li>Name and explain three methods of output control of generators and identify the rating or size of each of the generator.</li> <li>Detect, trouble shoot and service faulty charging system.</li> <li>Polarize a given generators and rewind armature coil to specification using armature rewinding machine method.</li> <li>Polarize a given generators and rewind armature rowinding machine method.</li> <li>Polarize a given generators and rewind armature rowinding machine method.</li> <li>A rotature reaction method</li> <li>A romature reaction method</li> <li>Compensated voltage control.</li> <li>Faulty charging systems</li> <li>Avo meter test for continuity and faulty components.</li> <li>Faulty charging systems – service with appropriate tools following correct sequence:         <ul> <li>Remove the generator from the engine of the automobile</li> <li>Dismantle the generator mature, brushes and field coil with appropriate how to start an engine and test a</li> </ul> </li> </ol>		automobile.	generators showing their physical	3. Examine and identify the
<ul> <li>and thous of output control of generators and identify the rating or size of each type of generator.</li> <li>a. Detect, trouble shoot and service faulty charging system.</li> <li>b. Polarize a given generators and rewind armature rewinding machine method.</li> <li>c. Methods of output control of generators.</li> <li>d. Polarize a given generators and rewind armature rewinding machine method.</li> <li>f. Armature reaction method</li> <li>i. Compensated voltage control</li> <li>ii. current-voltage control.</li> <li>Faulty charging system</li> <li>Wethods of trouble-shooting faulty charging systems</li> <li>i. Visual inspection for disconnections in the system</li> <li>ii. AVO meter test for continuity and faulty components.</li> <li>Faulty charging systems – service with appropriate tools following correct sequence:</li> <li>i. Remove the generator from the engine of the automobile</li> <li>ii. Dismantle the generator from the relative positions of the component.</li> <li>iii. Test generator armature, brushes and field coil with appropriate instrument.</li> <li>iii. Signa and field coil with appropriate for soft armature for both of start an engine and test a mergine and test a mergine and test a</li> </ul>		2. Name and explain three	leatures:	rating of size of each of the
<ul> <li>a. Interpole</li> <li>b. Interpole</li> <li>body of the mathine.</li> <li>control of generators.</li> <li>control of generators.</li> <li>control of generators.</li> <li>fealty charging system</li> <li>faulty charging systems</li> <li>i. AVO meter test for continuity and faulty components.</li> <li>Faulty charging systems – service with appropriate tools following correct sequence:</li> <li>i. Remove the generator from the engine of the automobile</li> <li>ii. Dismantle the generator roting the relative positions of the component.</li> <li>iii. Test generator armature, brushes and field coil with appropriate instrument.</li> <li>iiii Skin armature commutator. etc.</li> </ul>		methods of output	1. d.c. generator	generators as listed on the
<ul> <li>4. Deficit, trouble shoot and service faulty charging system.</li> <li>4. Polarize a given generators and rewind armature coil to specification using armature rewinding machine method.</li> <li>5. Methods of output control of generators.</li> <li>6. Methods of output control of generators.</li> <li>7. Faulty charging system</li> <li>8. Methods of trouble-shooting faulty charging systems</li> <li>i. Visual inspection for disconnections in the system</li> <li>ii. AVO meter test for continuity and faulty charging systems – service with appropriate tools following correct sequence:</li> <li>i. Remove the generator noting the relative positions of the component.</li> <li>iii. Test generator armature, frushes and field coil with appropriate instrument.</li> <li>iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii</li></ul>		control of generators and	ii. Interpole	A Demonstrate the different
<ul> <li>3. Detect, trouble shoot and service faulty charging system.</li> <li>4. Polarize a given generators and rewind armature coil to specification using armature rewinding machine method.</li> <li>4. Generator rating.</li> <li>5. Methods of output control of generators.</li> <li>6. Methods of output control generators.</li> <li>7. Faulty charging system</li> <li>8. Methods of trouble-shooting faulty charging systems</li> <li>i. AVO meter test for continuity and faulty components.</li> <li>9. Faulty charging systems – service with appropriate tools following correct sequence:</li> <li>i. Remove the generator roting the relative positions of the automobile</li> <li>iii. Dismantle the generator noting the relative positions of the component.</li> <li>iii. Test generator armature, brushes and field coil with appropriate instrument.</li> <li>iiii. Test generator armature commutator etrements.</li> </ul>		of each time of generator	in split field	4. Demonstrate the different methods of output control
<ul> <li>J. Detect, notice and years and rewind armature coil to specification using armature rewinding machine method.</li> <li>4. Generator rating.</li> <li>5. Methods of output control of generators.</li> <li>6. Methods of output control generators i. Armature reaction method</li> <li>ii. Compensated voltage control</li> <li>iii. Compensate voltage control</li> <li>iii. AVO meter test for continuity and falty charging systems – service with appropriate tools following correct sequence:</li> <li>i. Remove the generator from the engine of the automobile</li> <li>iii. Test generator armature, brushes and field coil with appropriate instrument.</li> <li>iv. Skin armature commutator. etc.</li> </ul>		3 Detect trouble shoot and	IV. spint netd.	of generators using the:
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<ul> <li>armature coil to specification using armature rewinding machine method.</li> <li>ii. Compensated voltage control.</li> <li>iii. current-voltage control.</li> <li>7. Faulty charging system</li> <li>8. Methods of trouble-shooting faulty charging systems</li> <li>i. Visual inspection for disconnections in the system</li> <li>iii. AVO meter test for continuity and faulty components.</li> <li>9. Faulty charging systems – service with appropriate tools following correct sequence:</li> <li>i. Remove the generator from the engine of the automobile</li> <li>iii. Dismantle the generator noting the relative positions of the component.</li> <li>iiii. Test generator armature, brushes and field coil with appropriate tool start an engine and test a method.</li> </ul>		generators and rewind	• i. Armature reaction method	5. Install and adjust fan belt
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iii. Test generator armature, brushes and field coil with appropriate instrument. iv. Skin armature commutator, etc. instrument an engine and test a mounted generator for			II. Dismantie the generator noting the	a generator to the engine
and field coil with appropriate instrument. iv Skin armature commutator, etc. instrument etc. iv Skin armature commutator, etc. iv Skin armature commutator etc. iv Skin armature commutator etc. iv Skin armature commutator etc.			iii Test generator armatura brushes	and fix the fan belt
instrument. an engine and test a			and field coil with appropriate	11 Demonstrate how to start
iv Skin armature commutator etc mounted generator for			instrument	an engine and test a
			iv. Skin armature commutator, etc	mounted generator for

S/N	TOPICS/OBJECTIVE	CONTENT		ACTIVITIES/REMARK
		10. Generator polarizing process.		normal working condition.
		11. Generator polarization.	12.	Demonstrate how to
		12. Process of generator mounting to engine		rewind an armature coil to
		and fixing of fan belt.		specification using
		13. Rewinding armature coil using armature		armature rewinding
		rewinding machine method.		machine method.
21.	The Alternator	1. Automobile alternator – identification.	1.	Exanmine and identify an
	1. Identify and explain with	2. a) Working principles of an alternator,		alternator in an
	the aid of labeled	b) Block diagram of an alternator.		automobile.
	diagram, the working	3. Alternator and d.c. generator – work	2.	Interpret the cross-
	principles of the	comparison.		sectional view of an
	alternator.	4. Advantages and limitation of the		alternator showing the
	2. Outline the working	alternator and the d.c. generator –	_	main parts/units.
	advantages, limitations	comparison.	3.	demonstrate how to detect
	and difference of the	5. a) Functions of main part/units of an		faults in an alternator
	alternator in comparison	alternator;		system by:
	with d.c. generator.	b) Cross-sectional diagram showing	4.	Demonstrate how to repair
	3. Detect/repair a faulty	main parts and units.		a faulty alternator by:
	alternator and test the	6. Fault detection in an alternator system		i. dismontling
	output of the alternator	i. Visual hispection for loose parts.		iii cleaning
	instruments	instruments		iv replacing
	A Explain the working	7 Repair of fault alternator by:		v reassembling
	rinciples of various	i removing the alternator and its		vi mounting the
	types of alternator	accessories from the automobile		alternator unto the
	circuits and rectifiers and	ii. dismantling the alternator noting the		engine and fix the fan
	remove the rectifier unit	relative positions of its working		belt correctly.
	from the alternator and	parts.	5.	Demonstrate how to test
	reassemble it.	iii. Cleaning the rotors of the alternator.		the output of the alternator
	5. Explain the working	iv. Cleaning the stator of the alternator		using appropriate
	principles and service	etc.		instrument e.g. AVO
	various types if	8. Alternator output		meter.
	regulators/circuits	9. Principles of the alternator rectifier.	6.	Demonstrate how to
	associated with the	10. Principle of the alternator circuits –		remove the rectifier unit
	automobile alternator	<ul> <li>Block diagram of the alternator circuits:</li> </ul>		from the alternator and
	using manufacturers	i. self excited circuits;		reassemble.
	manual specifications.	ii. battery excited circuits.	7.	Demonstrate how to test
		11. Dismantle and assemble the rectifier unit		the diode of the rectifier
		in the alternator.		unit with Ohmmeter and
		12. Diode rectifier unit – test using the	0	test lamp.
		i Obwardter	8.	Demonstrate how to
		1. Onimeter;		replace faulty diode in a
		11. Test famp.		addering iron
		rectifier unit using correct soldering	0	Demonstrate how to
		technique	9.	service or adjust
		14 Principles of regulators/circuit associated		automobile
		with automobile alternator system		regulators/regulator
		Block diagram of the following		circuits using
		regulators/circuits.		manufacturer's manual or
		i. built in regulators (transistorize).		specifications.
		ii. external regulator (eransistorized)		1
		15. Servicing/adjusting automobile regulator		
		circuits using manuals.		
22.	Relays	1. 6RA relay – identification	1.	Examine and identify a

S/N	TOPICS/OBJECTIVE	CONTENT ACTIVITIES/REM/	
	<ol> <li>Identify, explain the working principles and state the functions of a relay in an automobile charging system.</li> <li>Remove and fix back a relay from an auto electrical circuit.</li> </ol>	<ol> <li>Principles of a relay – using schematic diagram</li> <li>Functions of relay in an auto charging system.</li> <li>Cleaning and adjustment of relay in an auto electrical circuit.</li> <li>Replacement of a relay in an auto electrical circuit.</li> </ol>	<ul> <li>relay.</li> <li>2. Interpret the schematic diagram of a relay.</li> <li>3. Explain the functions of a relay in an auto-charging system.</li> <li>4. Demonstrate how to remove a relay from an auto electrical circuit for cleaning and adjustment.</li> <li>5. Demonstrate how to fix back a relay in auto electrical circuit.</li> </ul>

		1		r	
S/N	TOPICS/OBJECTIVE		CONTENT		ACTIVITIES/REMARK
1.	<b>Tools and Materials</b>	1.	Tools used in wiring operations of auto	1.	Examine and identify
	Select, name and identify		electrical systems:		different tools used in
	various tools and components		1. Pliers (assorted);		wiring operations of auto
	used in wiring operations of		11. Side-cutters		electrical systems.
	auto-electrical. Systems.		111. Cable stripper etc.	2.	Examine and identify
	State the use of each.	2			various components and
		Ζ.	Components and material used in auto		materials used in auto
			electrical wiring.		electrical wiring.
			i. switches (assorted),		
			ii. cables (assolted),		
			iv insulation tapes etc		
		3	Uses of:		
		5.	i switches:		
			ii cables fuses:		
			iii insulation tanes:		
			iv solder.		
			v protection grommet in auto		
			electrical works.		
2.	Soldering	1	Importance of soldering connection	1	Demonstrate how to make
	Select various tools and		ioints in a circuit.		common types of joints in
	materials for soldering joints	2.	Hazards in soldering:		automobile electrical
	in an electrical circuit, explain		i. burns;		wiring.
	its importance and enumerate		ii. electric shock	2.	Examine and identify
	the hazards involved.		iii. damages etc.	-	various tools and materials
		3.	Types of joints used in automobile		used for soldering joints in
			electrical wiring:		an electrical circuit.
			i. Loop joint;	3.	Demonstrate how to solder
			ii. Lap joint;		joints in an automobile
			iii. Tee joint etc.		electrical wiring circuit.
	•	4.	Tools and materials used for soldering	4.	Demonstrate how to apply
			joints in an electrical circuit.		fluid to the iron and joints.
		5.	Joints soldering observing safety		
			precautions.		
		6.	Types of fluxes used on electrical		
		1	connections.	-	· ·
3.	Cable Colour Coding	1.	Harnessing	1.	Harnessing
	Describe harnessing, identify	2.	Need for namessing	2.	Examine and identify
	hornessed and explain its man	<i>3</i> . ⊿	Colour order and sizes of each		harmossed
	namessed and explain its need.	4.	identification	2	Examine and identify
		5	Different hulbs used in auto mobile:	5.	cobles by their colour
		5.	i fees for hulb:		codes and sizes
			ii Edison screw type hulb	4	Examine and identify
			iii Wedge-based bulb	т.	different hulbs used in auto
			iv. Pre-focus bulb etc		mobile e.g. Edison screw
		6	Wiring diagram of a lighting circuit in an		type bulb etc.
		Ŭ.	auto-electrical system	5.	Show how to wire a
		7.	Operation of the lighting circuit in an	2.	lighting circuit from a
			auto-electrical system.		given auto electrical wiring
					diagram.
				6.	Demonstrate how to test

## 032 – AUTO BATTERY WIRING/LIGHTING AND ACCESSORIES CHARGING (CAE 16 & 17)

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
			the wiring of a lighting circuit in an auto-electrical system for good operation.
4.	<ul> <li>Wiring Circuit</li> <li>1. Identify various lamps and state the regulations for motor vehicle lamps, colours and lighting systems. Explain the functions of various lighting circuits.</li> <li>2. Read and interpret the wiring diagrams of auto lighting systems from manufacturers' manual and select appropriate instruments for aligning vehicle head lamps.</li> </ul>	<ol> <li>Regulations for motor vehicle lamps colour and lighting system.</li> <li>Lamps and colours and lamps used in lighting system.</li> <li>Functions of lighting circuit         <ol> <li>head, lamp circuit;</li> <li>side tail number plate and panel circuit;</li> <li>auto dazzle/fog lamps.</li> </ol> </li> <li>Wiring of auto lighting systems.</li> <li>Difference between a driving lamp (off alignment) and a properly adjusted lamp.</li> <li>Importance of correct alignment of driving lamps.</li> <li>Instruments used for aligning vehicle head lamps or beam setter.</li> <li>Methods of setting driving lamp to specification – local method.</li> </ol>	<ol> <li>Examine and identify various lamps and specify the colour to be used based on the regulation.</li> <li>Interpret the wiring diagram of auto lighting systems from manufacturers manual.</li> <li>Examine and identify various instruments used for aligning vehicle head lamps.</li> <li>Demonstrate how to set driving lamp to specification.</li> </ol>
5.	<ol> <li>Insulated Return Wire         <ol> <li>Prepare read and interpret the wiring diagram of an insulated return wire for an auto mobile.</li> <li>Name and identify various materials used for insulated return wire and outline kits importance</li> <li>Mark out position, drill and carry out installation of insulated return wiring circuit. Test the installation.</li> </ol> </li> </ol>	<ol> <li>Importance for insulated return wiring – elimination of fire outbreak on vehicle carrying inflammable liquids etc.</li> <li>Wiring diagram of an insulated return wire for an automobile.</li> <li>Preparation of wiring for an auto mobile.</li> <li>Materials used for insulated return wiring:         <ol> <li>conduit</li> <li>cable</li> <li>master switch</li> <li>live lamp holders</li> <li>clips</li> <li>fuse box etc.</li> </ol> </li> <li>Drilling and laying positions of accessories for an insulated return wiring.</li> <li>Installation of insulated return wiring</li> <li>circuit – testing.</li> </ol>	<ol> <li>Explain the importance for insulated return wiring. Emphasize the importance of an insulated return wiring.</li> <li>Interpret the wiring diagram of an insulated return wiring for an automobile.</li> <li>Demonstrate how to prepare a wiring diagram for an insulated return wiring for an automobile.</li> <li>Examine and identify different materials used for insulated return wiring e.g. conduit, cable etc.</li> <li>Demonstrate how to mark out position for drilling and laying of the accessories for an insulated return wiring.</li> <li>Demonstrate how to drill and carry our installation of insulated return wiring.</li> <li>Demonstrate how to test insulated return wiring</li> </ol>
6.	Double Battery Single Charging System Identify various types of blocking diodes used in the double battery single charging	<ol> <li>Uses of double battery single charging system – police patrol van etc.</li> <li>Circuit diagram of a double battery unit using single charging system.</li> <li>Functions and operations of blocking</li> </ol>	<ol> <li>Interpret the circuit diagram of a double battery unit using a single charging system.</li> <li>Examine and identify the</li> </ol>

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK	
	system and explain their functions and operations.	<ul> <li>diode in the double battery unit using single charging system.</li> <li>4. Blocking diodes in the double battery unit using a single charging system – identification.</li> <li>5. Types of block diodes used in the double battery single charging system: <ol> <li>negative earth type</li> <li>positive earth type</li> </ol> </li> <li>6. Installation of a double battery single charging system.</li> <li>7. Installation of a double battery single charging system.</li> <li>8. Installation of a double battery single charging system.</li> </ul>	3. 4. 5.	blocking diodes in double battery unit using a single charging system. Examine and identify different types of blocking diodes used in the double battery charging system. Demonstrate how to install a double battery single charging system. Demonstrate how to test the installed double battery single charging system.
7.	<ul> <li><u>Anti-Theft Circuit</u></li> <li>Prepare wiring circuit diagram, install and test anti-theft device and give examples of various types.</li> <li>Trouble-shoot and rectify faulty anti-theft device circuit.</li> </ul>	<ol> <li>Examples of different types of anti theft devices used in automobile;</li> <li>Wiring circuit diagram for a given anti- theft device.</li> <li>Installation of anti-theft device.</li> <li>Anti-theft device – Testing</li> <li>Trouble shoot of a faulty anti-theft device circuit.</li> <li>Faults in the anti-theft device – rectification.</li> </ol>	1. 2. 3. 4. 5. 6.	Examine and identify different types of anti-theft devices used in automobile. Show how to prepare wiring diagram for a given anti-theft device. Demonstrate how to install an anti-theft device. Demonstrate how to test anti-theft devices. Show how to trouble shoot a faulty anti-theft device circuit. Show how to rectify the faults in the anti-theft device.
8. 9.	Printed Circuit         1. Identify and read printed circuit and state the need for its use.         2. De-solder and resolder components from and to a printed circuit without damaging the unit.         Electric Horn	<ol> <li>Need for a use of printed circuit in automobile electrical wiring.         <ol> <li>minimization of short circuits</li> <li>reducing number of wiring and cost.</li> </ol> </li> <li>Printed circuit – identification.</li> <li>Printed circuit diagram – reading</li> <li>Printed circuits faults – diagnosis and rectification.</li> <li>De-soldering and re-soldering of components from and to a printed circuit.</li> <li>Printed circuit unit – removal and replacement.</li> <li>Electric Horns</li> </ol>	1. 2. 3. 4. 5.	Examine and identify a printed circuit. Demonstrate how to read printed circuit diagram. Demonstrate how to diagnose and rectify faults in a given printed circuit Demonstrate how to de- solder and re-solder components from and to a printed circuit without damaging the unit. Demonstrate how to replace a printed circuit unit. Examine and identify
	<ol> <li>Sketch an outline diagram and identify various types of electric horn and explain the working of the circuit.</li> <li>Trouble shoot service, rectify adjust and install</li> </ol>	<ol> <li>Principles of Horn system:         <ol> <li>Air or vacuum horn</li> <li>Wind tone horn</li> <li>High frequency horn</li> </ol> </li> <li>Working of the electric horn circuit – outline diagram of an electric horn.</li> </ol>	2.	various types of electric horns. Interpret the outline diagram of an electric horn circuit. Demonstrate how to install

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REM	MARK
	faulty electric horn system in an automobile using manufacturer's specification.	<ol> <li>Automobile electric horn system – installation using manufacturer's specification.</li> <li>Electric horn circuit – rectification of faults by trouble shooting techniques.</li> <li>Electric Horn – service and adjustment</li> </ol>	<ul> <li>an electric horn s an automobile sy using manufactu specifications.</li> <li>4. Demonstrate how trouble shoot and faults in a horn of 5. Demonstrate how service and adjust horn.</li> </ul>	system in /stem rer's v to d rectify circuit. w to st electric
10.	<ul> <li>Windscreen Wipers</li> <li>Draw a schematic diagram and identify various types of windscreen wipers and explain its operations and functions.</li> <li>Trouble shoot, service and install a faulty windscreen wiper circuit following given instructions.</li> </ul>	<ol> <li>Windscreen wipers (types) – identification:         <ol> <li>single stroke;</li> <li>rack and pinion/linkage type;</li> <li>rack and pinion/linkage type;</li> <li>vacuum type.</li> </ol> </li> <li>Operation of windscreen wiper and screen washer with the aid of a diagram.</li> <li>Functions of the windscreen wiper – schematic diagram showing:         <ol> <li>control system;</li> <li>wiper blades etc.</li> </ol> </li> <li>Windscreen wiper and washer system – installation to manufacturer's specification.</li> <li>Windscreen wiper circuit – rectification of faults by trouble shooting techniques.</li> <li>Windscreen wiper and washer – servicing and maintenance.</li> </ol>	<ol> <li>Examine and ide various types of windscreen wipe single strokes wi and linkage type</li> <li>Interpret schema diagram of a win wiper from the c the wiper blades</li> <li>Demonstrate how a windscreen wip system to manuf specification.</li> <li>Demonstrate how trouble shoot fau windscreen wipe and how to rectifi faults.</li> <li>Demonstrate how service and ma windscreen wipe washer</li> </ol>	ntify rs e.g. per, rack s etc. tic ad screen ontrol to v to install per/washer acturer's v to ilty r circuit fy the ow to iintain er and
11.	<ul> <li>Electric Fuel Pump <ol> <li>Draw a schematic         <ul> <li>diagram and identify an             electric fuel pump in a             motor vehicle. Explain             its working principles.</li> </ul> </li> <li>Trouble shoot, service         <ul> <li>and install faulty electric         <ul> <li>fuel pump system in a             vehicle using             manufacturer's manual             or instructions.</li> </ul> </li> </ul></li></ol></li></ul>	<ol> <li>Electric fuel pump in a motor vehicle identification.</li> <li>Operational principles of an electric fuel pump. – with the aid of diagram.</li> <li>Functions of the various parts of the electric fuel pump circuit. – with the aid of a schematic diagram.</li> <li>Electric fuel pump system in a vehicle – installation using manufacturer's manual.</li> <li>Electric fuel pump circuit – rectification of faults by trouble-shooting techniques.</li> <li>electric fuel pump – service and maintenance using a manual.</li> </ol>	<ol> <li>Examine and ide electric fuel pum motor vehicle.</li> <li>Interpret the sche diagram of an ele pump circuit.</li> <li>Demonstrate how electric fuel pum in a vehicle using</li> <li>Demonstrate how trouble-shoot fau electric fuel pum and rectify the fai</li> <li>Demonstrate how service an electric pump using a ma</li> </ol>	ntify an ip in a ematic ectric fuel w to install ip system g manual. w to ilty ip circuit ault. w to ic fuel anual.
12.	Direction Indicator           1. With the aid of a schematic diagram, explain the working of a direction indicator system and locate its	<ol> <li>Indicator control in an automobile – location and direction.</li> <li>Operation of direction of indicator system in an automobile – illustrate with a schematic diagram.</li> <li>Direction indicator system in an</li> </ol>	<ol> <li>Demonstrate how the position of di indicator control automobile.</li> <li>Interpret schema diagram of a dir</li> </ol>	v to locate irection in an tic ection

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
	<ul> <li>position in an automobile.</li> <li>2. Trouble-shoot, rectify and install faulty direction indicator system in an automobile using manufacturer's manual or instruction.</li> </ul>	<ul> <li>automobile – installation using system manufacturer's manual.</li> <li>4. Direction indicator circuit – rectification of fault by trouble shooting techniques.</li> </ul>	<ul> <li>indicator system of an automobile.</li> <li>3. Demonstrate how to install a direction indicator circuit system in an automobile using manual.</li> <li>4. Demonstrate how to trouble shoot faulty direction indicator circuit and how to rectify the faults.</li> </ul>
13.	<ul> <li>Cigarette Lighter <ol> <li>With the aid of a schematic diagram, describe the working principles of the cigarette lighter.</li> <li>Locate its position on the dashboard of a motor vehicle</li> </ol> </li> </ul>	<ol> <li>Cigarette lighter in a motor vehicle – location and position.</li> <li>Operational principle of the cigarette lighter.</li> <li>Auto cigarette lighter circuit – illustration by schematic diagram.</li> <li>Cigarette lighter circuit – rectification of fault by trouble shooting technique.</li> </ol>	<ol> <li>Show the location of a cigarette lighter on the dashboard of a motor vehicle.</li> <li>Interpret the schematic diagram of the auto cigarette lighter circuit.</li> <li>Demonstrate how to trouble-shoot faulty cigarette lighter circuit and rectify the fault.</li> </ol>
14.	<ol> <li>Gauge         <ol> <li>Describe the working principles of various types of gauges and locate their position on the dashboard.</li> <li>Trouble shoot and detect faults in the various gauges.</li> </ol> </li> </ol>	<ol> <li>Location of gauges on an automobile dashboard.</li> <li>Operational principles of:         <ol> <li>a) oil pressure gauges</li> <li>temperature gauges – detection of faulty readings.</li> <li>a) oil pressure gauges</li> <li>temperature gauges – rectification of fault by trouble shooting techniques.</li> </ol> </li> </ol>	<ol> <li>Show the location of various gauges on the dashboard e.g. oil pressure gauges/sensing unit including the oil switch etc.</li> <li>Demonstrate how to detect faulty readings in oil pressure and, temperature gauge etc.</li> <li>Demonstrate how to trouble shoot and rectify faults common to oil pressure and temperature gauges, etc.</li> </ol>
15.	<ul> <li>Heater System</li> <li>With the aid of diagrams explain the working of the automobile interior heater and locate the unit in an automobile.</li> <li>Trouble shoot service and install a faulty heating system in a motor vehicle to manufacturer's specification.</li> </ul>	<ol> <li>Interior heater unit – location</li> <li>Operation of interior heater in an automobile with the aid of diagrams.</li> <li>Heating system in an automobile- rectification of fault by trouble shooting techniques.</li> <li>Heating system in an automobile – installation using manufacturer's specification.</li> <li>Interior heater system – service and maintenance using given instructions.</li> </ol>	<ol> <li>Show how to locate the interior heater unit in an automobile.</li> <li>Demonstrate how to trouble shoot faulty heating system and how to rectify them.</li> <li>Demonstrate how to install a heating system in a motor vehicle to specification.</li> <li>Demonstrate how to service the interior heater system of a motor vehicle following given instructions.</li> </ol>
16.	<u>Cooling Fan Unit</u>	1. Cooling fan unit in an motor vehicle.	1. Demonstrate how to locate

S/N	TOPICS/OBJECTIVE	CONTENT	ACTIVITIES/REMARK
	<ol> <li>Describe the working of the cooling fan system and locate the unit in a motor vehicle.</li> <li>Trouble shoot, service, rectify cooling fan unit in a motor vehicle.</li> </ol>	<ol> <li>Operations of cooling fan system – location.</li> <li>Cooling fan system in a motor vehicle – service and maintenance using specific instruction.</li> <li>Cooling fan system in a motor vehicle – installation.</li> </ol>	<ul> <li>the cooling fan unit in a motor vehicle.</li> <li>2. Demonstrate how to service the cooling fan of a motor vehicle given a manual.</li> <li>3. Demonstrate how to install a cooling fan in a motor vehicle.</li> </ul>
17.	<u>Car Radio</u> Locate and install the car radio with its antenna and associated gadgets.	<ol> <li>Car Radio         <ol> <li>location of antenna.</li> <li>Cassette deck</li> <li>Speakers etc.</li> </ol> </li> <li>Car Radio         <ol> <li>a) sources of static interferences</li> <li>Components used to suppress all sources of static interferences in a motor vehicle.</li> </ol> </li> </ol>	Demonstrate how to install a car radio with the antenna and associated gadgets in a motor vehicle.
18.	<ul> <li><u>Air Conditioner</u></li> <li>1. Locate air conditioner unit in a car.</li> <li>2. Trouble shoot, detect, rectify leakage in auto air conditioner.</li> </ul>	<ol> <li>Airconditioner unit in a motor vehicle – location.</li> <li>Auto airconditioner - repair by trouble- shooting techniques and replacement of the following components:         <ol> <li>compressor clutch</li> <li>condenser cooling clutch</li> <li>conditioner fan</li> <li>relays</li> <li>fuse</li> <li>switch.</li> </ol> </li> <li>Auto airconditioner – detection of leaks by leak detectors etc.</li> <li>Auto airconditioner – rectification of leaks by:         <ol> <li>Tightening loose connections.</li> <li>Replacing rubber hoses or porous pipe.</li> </ol> </li> <li>Discharging auto airconditioner unit.</li> <li>Charging of airconditioner unit using:         <ol> <li>ferron 12</li> <li>compressor oil level</li> <li>check</li> </ol> </li> </ol>	<ol> <li>Identify airconditioner unit in a car.</li> <li>Demonstrate how to trouble shoot faulty auto airconditioner and how to replace faulty components e.g. compressor clutch, conditioner fan etc.</li> <li>Demonstrate how to detect leaks in auto airconditioner with the aid of leak detector.</li> <li>Show how to rectify leakage in auto air- conditioner by tightening loose connections, replacing rubber hoses of porous pipes etc.</li> <li>Show how to discharge auto airconditioner with discharging machine.</li> </ol>
19.	<ul> <li><u>Stabilizer</u></li> <li>1. Locate the voltage stabilizer unit in a motor vehicle.</li> <li>2. Detect, rectify and install faulty voltage stabilizer unit in an automobile.</li> </ul>	<ol> <li>Voltage stabilizer unit in a motor vehicle         <ul> <li>location</li> <li>Auto voltage stabilizer – Detection and rectification of fault.</li> <li>Voltage stabilizer unit in an automobile             <ul></ul></li></ul></li></ol>	<ol> <li>Identify the location of the voltage stabilizer unit in a motor vehicle.</li> <li>Demonstrate how to detect and rectify faults in auto vehicle stabilizer.</li> <li>Demonstrate how to install a voltage stabilizer unit in an automobile.</li> </ol>
20.	Miscellaneous Accessories	1. Electrical Accessories in a motor vehicle	1. Examine and identify the

S/N TOPICS/OBJE	ECTIVE	CONTENT		ACTIVITIES/REMARK
<ol> <li>Identify and test various compon electrical access in motor vehicle</li> <li>Remove, repair the accessories.</li> </ol>	t the nents of sories used e. 2. and install 3.	<ul> <li>identification of:</li> <li>i. electric window</li> <li>ii. electrically operated radio antenna. Automobile accessories components – testing the components namely:</li> <li>i. electric window</li> <li>ii. electrically operated radio antenna. Automobile accessories – removal, repair and installation of:</li> <li>i. electric window</li> <li>ii. electric window</li> <li>ii. electrically operated radio antenna.</li> <li>iii. motor driven seat adjuster</li> <li>iv. rear window screen wiper etc.</li> </ul>	2.	various electrical accessories used in motor vehicles e.g. electric windows, head lamp flaps etc. Demonstrate how to test the components of the accessories used in motor vehicles e.g. electric windows, electrically operated radio antenna, rear windows etc. Demonstrqate how to remove, repair and install the accessories e.g. electrically operated radio antenna, electric window etc. in a motor vehicle.
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