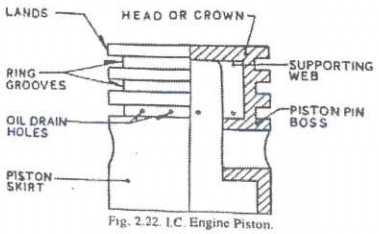
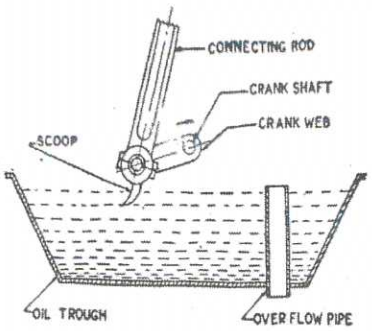
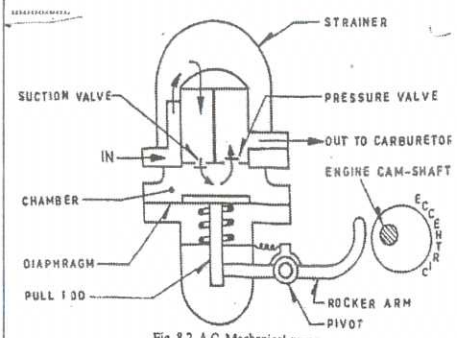
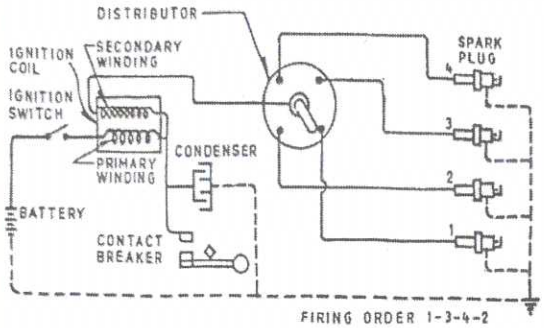
Scoring Indicators

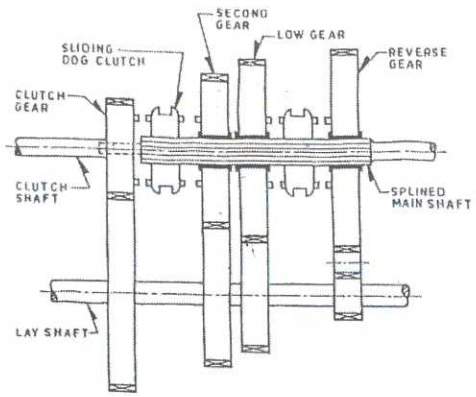
COURSE NAME: AUTOMOBILE ENGINEERING

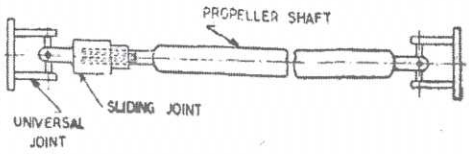
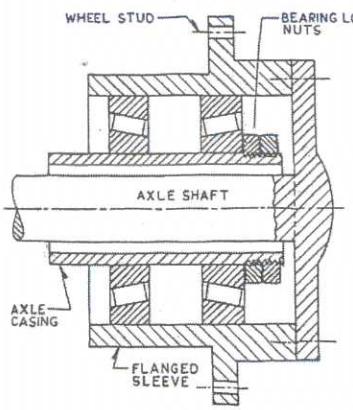
COURSE CODE: 4023 **QID : 2103230221**

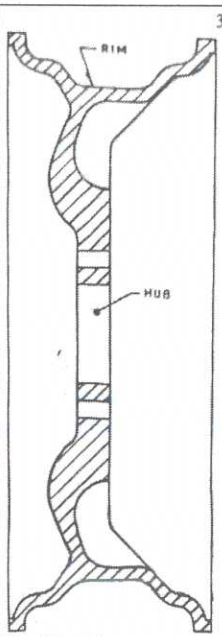
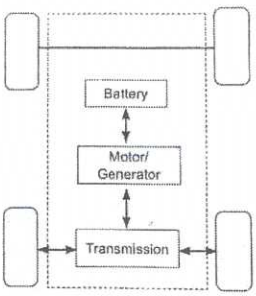
Q No	Scoring Indicators	Split score	Sub Total	Total score
	PART A			**9**
I. 1	Internal combustion engine	1	1	
I. 2	Lead acid battery	1	1	
I. 3	Speed and torque	1	1	
I. 4	Differential	1	1	
I. 5	Epicyclic gear system	1	1	
I. 6	Steering system	1	1	
I. 7	Hydraulic brake system	1	1	
I. 8	Hybrid vehicle	1	1	
I. 9	Plug – in Hybrid Electric Vehicles	1	1	
	PART B			24
II. 1	Cylinder block, cylinder head, crank case, piston connecting rod, crank shaft engine valves etc (any three)	1 x 3	3	
II. 2	Petroil system, Splash system, Pressure system, Dry sump system (any three)	1 x 3	3	
II. 3	FUNCTIONS OF A CARBURETTOR 1. To keep a small reserve of fuel at a constant head. 2. To vaporize the fuel to prepare a homogeneous air fuel mixture. 3. To supply correct amount of the air fuel mixture at the correct strength under all conditions of load and speed of the engine.	1 x 3	3	
II. 4	Clutch, gear box, propeller shaft, differential	Any three 1 x 3	3	
II. 5	A clutch is a mechanism which enables the rotary motion of one shaft to be transmitted at will to second shaft, whose axis is coincident with that of first. It is located between the engine and the gear box.	2 + 1	3	
II. 6	1. To prevent the road shocks from being transmitted to the vehicle components 2. To safeguard the occupants from road shocks. 3. To preserve the stability of the vehicle in pitching or rolling, while in motion.	1x 3	3	

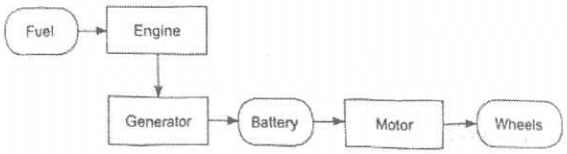
II. 7	Camber is the tilt of the car wheels from the vertical. Camber is positive if the tilt is outward at the top. Camber is also called 'wheel rake'.	1x 3	3	
II. 8	1. To support the vehicle load. 2. To provide cushion against shocks. 3. To transmit driving and braking forces to the road. 4. To provide cornering power for smooth steering.	Any three 1 x 3	3	
II.9	Brake system in automobile helps to stop the vehicle within smallest possible distance (a) Mechanical brakes (b) Hydraulic brakes (c) Electric brakes (d) Vacuum brakes (e) air brakes	1 + 2	3	
II.10	Petrol engine, Electric motor, Electric generator, Controller , DC/DC convertor, Batteries, Fuel tank etc.		3	
	PART C			42
III. 1	 Fig. 2.22. I.C. Engine Piston. **Functions** The functions which a piston is called upon to perform in an I.C. engine 1. To transmit the force of explosion to the crankshaft. 2. To form a seal so that the high pressure gases in the combustion. chamber do not escape into the crankcase. 3. To serve as a guide and a bearing for small end of the connecting rod.	Fig 3 Explanation 4	7	7
III. 2	 Fig. 6.7. Splash system lubrication. **Splash System** It is one of the cheapest methods of engine lubrication. A scoop is made in the lowest part of the connecting rod and the oil is stored in the oil trough it being pumped there from the crankcase oil sump. When the engine runs, the scoop causes the oil to splash on the cylinder walls each time it passes through its B.D.C. position. This affects the lubrication of engine walls, gudgeon pin, main crankshaft bearings, big end bearings etc.	Fig 3 Explanation 4	7	7
III. 3	The drive for the pump is taken from the camshaft by means of an eccentric or cam. The eccentric operates the rocker arm which is in conjunction with the diaphragm return spring, which pushes the diaphragm up and down.	Any 7 1 mark each	7	7

	The downward movement of the diaphragm causes vacuum in in the chamber which causes the inlet valve to open and the fuel then goes through the strainer into the chamber. The next upward movement of the diaphragm causes the inlet valve to close while the outlet valve opens and the fuel goes out to the carburetor float chamber.  Fig. 8.2. A.C. Mechanical pump.			
III. 4	In Battery Ignition System, when the Ignition Switch is turned on, the current will flow to the primary circuit through ballast register, primary winding and contact breaker  Fig. 12.2. Battery ignition system for 4-cylinder engine. The flowing current induce a magnetic field around the primary winding, the more current we supply the more magnetic filed will generate. At a certain time, the contact breaker opens the circuit through the primary winding and fall. This sudden fall of current generates very high voltage around 300 V in the primary winding section. Due to this immense amount of voltage the capacitor comes into the charging state. When the capacitor is fully charged then it starts delivering the current towards the battery. Due to this reverse flow of the current and already induced magnetic field in the primary winding, a very high voltage of 15000 V to 30000 V is generated in the secondary winding. This high voltage current is then transferred to the distributor via high tension cable	Fig 3 Explanation 4	7	7
III. 5	***REQUIREMENTS OF CLUTCH*** (1) **Torque transmission:** The clutch should be able to transmit the maximum torque of the engine under all conditions. It is usually designed to transmit 125 to 150 per cent of the maximum engine torque. (2) **Gradual engagement:** The clutch should positively take the drive gradually without the occurrence of sudden jerks.	Fig 4 Marking 3	7	7

	(3) **Heat dissipation:** During clutch application, large amounts of heat are generated. The rubbing surfaces should have sufficient area and mass to absorb the heat generated. The proper design of the clutch should ensure proper ventilation or cooling for adequate dissipation of the heat. (4) **Dynamic balancing:** This is necessary particularly in the high-speed clutches. (5) **Vibration damping:** Suitable mechanism should be incorporated within the clutch, to eliminate noise produced in the transmission. (6) **Size:** The size of the clutch must be smallest possible so that it should occupy minimum amount of space. (7) **Inertia:** The clutch rotating parts should have minimum inertia. Otherwise, when the clutch is released for gear changing, the clutch plate will keep on spinning, causing hard shifting and gear clashing in spite of synchronizer. (8) **Clutch free pedal play:** To reduce effective clamping load on the carbon thrust bearing and wear thereof, sufficient clutch free pedal play must be provided in the clutch. (9) **Ease of operation:** For higher torque transmissions the operation of disengaging the clutch must not be tiresome to the driver.			
III. 6	**CONSTANT MESH GEAR BOX**  Fig. 4.9. Constant mesh gear box. In this type of gear box, all the gears are in constant mesh with the Corresponding gears on the layshaft. The gears on the main shaft which is splined, are free The dog clutches are provided which are free to dide on the main shaft. The gears on the layshaft are, however, fixed. When the left dog clutch is slid to the left by means of the selector mechanism, its teeth are engaged with those on the clutch gear and we get the direct gear. The same dog clutch, however, when slid to right makes contact with the second gear and second gear is obtained. Similarly movement of the right dog clutch to the left results in low gear and towards right in reverse gear.	Fig 3 Explanation 4	7	7
III. 7	**PROPELLER SHAFT**	Fig 3 Explanation 4	7	7

	 Fig. 5.1. Propeller Shaft. This is the shaft which transmits the drive from the transmission to the bevel pinion or worm of final drive in front engine, rear drive vehicles. It is also called drive shaft. It consists mainly of three parts: **(a) Shaft**-As this has to withstand mainly torsional loads, it is usually made of tubular cross-section. It also has to be well balanced to avoid whirling at high speeds. **(b) One or two universal joints**, depending upon the type of rear axle drive used. The universal joints account for the up and down movements of the rear axle when the vehicle is running, **(c) Slip joint**-Depending upon the type of drive, one slip joint may be there in shaft. This serves to adjust the length of the propeller shaft when demanded by the rear axle movements.			
III. 8	 Fig. 5.45. Pull-floating axle. **Full-floating axle** This type is very robust one and is used for heavy vehicles. The axle shafts have flanges at the outer ends, which are connected to the flanged sleeve by means of bolts. There are two taper roller bearings supporting the axle casing in the hub, which take up any side toad. Thus in this the axle shafts carry only the driving torque. The weight of the vehicle and the end thrust are not carried by them, the weight being completely supported by the wheels and the axle casing.	3 -Fig 4 - explanation	7	7
III. 9	**FUNCTIONS** Primary function of the steering system is to achieve angular motion of the front wheels to negotiate a turn. Secondary functions of steering system are: 1. To provide directional stability of the vehicle when going straight-ahead. 2. To provide perfect steering condition 3. To facilitate straight ahead recovery after completing a turn. 4. To minimize tyre wear. **REQUIREMENTS** The requirements of a good steering system are: 1. The steering mechanism should be very accurate and easy to handle. 2. The effort required to steer should be minimal and must not be tiresome to the driver.		4+3	7

	3. The steering mechanism should also provide directional stability.			
III. 10	 Fig. 8.11. Light alloy cast whee 3 Light alloy cast or forged wheel wheels made from **aluminium or magnesium alloys** **The main advantage of light-alloy wheels** 1.Reduced weight which reduces unsprung weight. A magnesium alloy wheel weighs about 50 per cent of a steel wheel and about 70 per cent of an aluminium alloy wheel for similar strength. 2.Light alloys are better conductors of heat which helps the wheels dissipate any heat generated by the tyres or brakes and thereby run cooler. 3.Wider rims, which improves stability on cornering.		Fig – 3 Explanation 4	7
III. 11	 Fig. 5.1: Layout of an electric vehicle Electric vehicles are defined as vehicles which use an electric motor for propulsion. Electric motors, receiving power from an onboard source of electricity such as batteries, fuel cells, ultracapacior, flywheel, etc. When the car pedal is pressed, then: Controller takes and regulates electrical energy from batteries and inverters. .With the controller set, the inverter then sends a certain amount of electrical energy to the motor (according to the depth of pressure on the pedal). Electric motor converts electrical energy into mechanical energy (rotation). . Rotation of the motor rotor rotates the transmission so the wheels turn and then the car moves.		Lay out – 3 Working - 4	7

III. 12	 **Petrol engine** The engine is similar to those fitted to conventional vehicles e.g. four cylinders, four-stroke normally aspirated, etc. However, the capacity of the engine used is usually relatively small. These engines are lightweight and very fuel efficient. **Electric motor** The electric motor is used to propel the car, however with the use of electronic technology, the motor can also function as a generator to recharge the batteries. **Electric generator** Electric generator generates electricity from the rotating wheels while braking, transferring that energy back to the traction battery pack. **Controller** Controller is connected to the accelerator pedal, for directing the flow of electricity from the energy source to the motor. **DC/DC converter** This device converts higher-voltage DC power from the traction battery pack to the lower-voltage DC power needed to run vehicle accessories and recharge the auxiliary battery. **Transmission** The transmission transfers mechanical power from the engine and/or electric traction motor to drive the wheels. The transmission can be either manual or automatic. **Batteries** The batteries provide the energy source for the electric motor, either recharged by an external power source or recharged by the generator or electric motor when it is functioning as a generator. Most electric cars use lead-acid batteries.		Lay out – 3 Work ing - 4	7

BLUE PRINT

Mark Distribution

Module	Hr / Module	(hi / ∑Hi) * 123	TYPE OF QUESTIONS							
			PART A		PART B		PART C		TOTAL	
			No of Questions	Marks	No of Questions	Marks	No of Questions	Marks	No of Questions	Marks
I	18	37	2	2	3	9	4	28	9	39
II	17	35	3	3	2	6	4	28	9	37
III	15	31	2	2	4	12	2	14	8	28
IV	10	21	2	2	1	3	2	14	5	19
Total	60	123	9	9	10	30	12	84	31	123

Cognitive Level Wise Question Analysis

Mark Distribution

Cognitive Level	% Marks	Marks	TYPE OF QUESTIONS							
			PART A		PART B		PART C		TOTAL	
			No of Questions	Marks	No of Questions	Marks	No of Questions	Marks	No of Questions	Marks
R	30	37	9	9	7	21	1	7	15	37
U	70	86	0	0	3	9	11	77	16	86
A										
Total	100	123	9	9	10	30	12	84	31	123