TE|SemV|CBSGS|MECH/AUTO|ICE|M-J-18 25|05|18

Auto

Q. P. Code: 39559

Time: 3 Hours **Marks: 80**

Note: 1 Q.No.1 is **compulsory.**
2. Attempt any **Three** question from Q.No.2 to Q.No.6
3. Make suitable assumptions if required

Q.No.1 Solve Any **Four** **(5*4)**

a) Compute the bmep in bar, mean piston speed in m/s and torque in Nm for a two stroke, four cylinder C. I. engine having following specifications bore dia. 150 mm, brake power 265 kW at 2400 rpm, L/d ratio of 0.90. Also identify whether this engine is a square, over square or under square engine.

b) Why C.I engines exhibit more favorable fuel consumption at part load and idling, compared to the carbureted S.I engines?

c) What is mean by opposed type and radial type engine?

d) The diameter and stroke length of a single two stroke engine working on the constant volume cycle are 100 mm and 200 mm respectively with clearance volume 2.75 liters. When the engine is running at 120 rpm the indicated mean effective pressure was 5bar and gas consumption 2.5 kg/hr. If the calorific value of the gas used is 16350 kJ/kg.

Find: (i) Air standard efficiency
(ii) Indicated power developed by the engine and
(iii) Indicated thermal efficiency of the engine.

e) State the difference between ignition timing and firing order.

Q.No.2 a) The following observations were recorded in a test of one hour duration on a single cylinder oil engine working on four-stroke cycle and engine is fitted with rope brake: **(14)**

Bore = 150 mm; Stroke = 300 mm; Fuel used = 2.4 kg; Calorific value of fuel = 42000 kJ per kg; Average speed = 300 rpm; Indicated mean effective pressure = 7 bar; The dead load on the engine = 360 N; Spring balance reading = 30 N; Quantity of cooling water = 300 kg; Temperature rise of cooling water = 35 °C; Diameter of the brake wheel = 1.2 m; Air used = 52.8 kg; Temperature of air in test room = 20 °C; Temperature of exhaust gases = 410 °C; Cp (gases) = 1 kJ/kg K; Atmospheric Pressure = 1.013 bar, Calculate:
(i) Indicated Power
(ii) Brake thermal efficiency.
Draw the heat on minute and percentage basis.

b) Justify the requirement of air motion and swirl in a C. I. Engine combustion chamber is much more stringent than in an S. I. Engine. **(6)**

Q.No.3 a) Describe with suitable sketches the combustion phenomenon in SI engine. Explain the three phases of combustion. Discuss the effect of engine variables on ignition Lag. **(10)**

b) State the reasons for efficiency of actual cycle is much lower than the air standard cycle efficiency? List the major losses and differences in actual engine cycle and air standard cycle. **(10)**

Q.No.4 a) Explain how supercharging helps to improve the power output. What are its limitations **(5)**

b) The following data relate to a four-stroke cycle petrol engine of Hindustan Ambassador: Capacity of the petrol engine = 1489 C.C., Speed at which maximum power is developed = 4200 RPM, The volumetric and efficiency (at the above speed) = 75%, The air-fuel ratio = 13 : 1, Theoretical air speed at choke (at peak power) = 85 meter per sec., The Coefficient of discharge for venturi C_{da} = 0.82, The Coefficient of discharge for the main petrol jet C_{da} = 0.65, The specific gravity of petrol = 0.74, Level of petrol surface below the throat = 6 mm, Atmospheric pressure and temperature = 1.013 bar and 20°C respectively. An allowance should be made for the emulsion tube, the diameter of which can be taken as 40% of the choke diameter. Calculate the, sizes of a suitable choke and main jet. **(10)**

c) Describe with neat sketches the working of Wankel Engine. **(5)**

Q.No.5 a) Differentiate **(Any Two)** **(5*2)**

i) Scavenging and Supercharging. ii) Wet sump and Dry sump lubrication.

iii) Water cooling and Air cooling

b) Determine the Air-Fuel Ratio (A/F) and percentage richness supplied at 4 km altitude by a carburetor, which is initially adjusted to give 10% lean mixture at sea level. The ambient conditions at sea level are 27 °C and 1 bar. Assume that the temperature of air decreases with altitude given by **(10)**

$t = t_S - 0.00675\ h$, where, h is height in meters and t is sea level temperature in °C.

The air pressure decreases with altitude as per the relation

$\mathbf{h = 19{,}000 \log_{10}(1/P)}$ where P is in bar, State any assumptions made.

Q.No.6 a) An air compressor is being run by the entire output of a supercharged 4-stroke cycle diesel engine. Air enters the compressor at 25°C and is passed on to a Cooler where 1210 kJ per mm is rejected. The air leaves the cooler at 65°C and 1.75 bar. Part of this air-flow is used to supercharge the engine which has a volumetric efficiency of 72% based on induction manifold condition of 65°C and 1.75 bar. The engine, which has six cylinders of 100 mm. bore and 110 mm stroke runs at 2000 rpm and delivers an output torque of 150 Nm. The mechanical efficiency of engine is 80%. **(15)**

Evaluate:—

(i) The indicated mean effective pressure of the engine;

(ii) The air consumption rate of the engine;

(iii) The air-flow into compressor in kg per min.

b) What is vapors lock? How is it related with ASTM distillation curve of the fuel? **(5)**
