

mech
AUTO

Sub: - ICE

Date: 28/11/14



QP Code : 14889

(3 Hours)

[Total Marks : 80

- N.B. : (1) Question number one is compulsory.
 (2) Attempt any three questions from remaining five questions.
 (3) Assume suitable data if necessary and state it clearly.

1. State whether following statements are true or false and justify :— 20
- For same heat input and constant maximum pressure Otto cycle is better than diesel cycle.
 - Spark plug and exhaust valves are located away from each other inside combustion chamber of spark ignition engine.
 - Swirl instead of turbulence is required inside CI engine combustion chamber.
 - Specific fuel consumption for supercharged SI engine is more than naturally aspirated SI engine.
 - Higher the Octane number higher is the possibility of detonation.
2. (a) With neat sketch explain thermosyphon type water cooling system. 8
 (b) An Otto cycle with a compression ratio of 10 uses a fuel with a calorific value of 48000 kJ/kg. The air fuel ratio is 15:1. The temperature and pressure at the end of suction stroke are 57°C and 1 bar respectively. Determine the maximum pressure in the cycle. The adiabatic index of compression is 1.36. The variation of specific heat at constant volume heat addition with respect to temperature is expressed as $C_v = 0.7117 + 2.1 \times 10^{-4}T$. If the C_v remains constant at 0.7117 kJ/kgK, together with adiabatic index, what would be the changes in the maximum pressure ? 12
3. (a) With neat sketch explain compression induced swirl and divided combustion chamber. Also state its advantages and disadvantages. 8
 (b) The venturi of a simple carburetor has throat diameter of 35 mm and the coefficient of air flow as 0.85. The fuel orifice has a diameter of 2.3 mm and the coefficient of fuel flow is 0.66. The petrol surface is 5 mm below the throat. Find 12
- The air fuel ratio for a pressure drop of 0.07 bar when the nozzle lip is neglected
 - The air fuel ratio when the nozzle lip is taken into account
 - The minimum velocity of air flow required to start the fuel flow when nozzle lip is provided
- Take density of air and fuel as 1.2 and 750 kg/m³.

[TURN OVER

4. (a) Compare detonation in SI and CI engine. 8
- (b) A four stroke cylinder gasoline engine has six cylinders of 80 mm bore and 100 mm stroke. The engine is coupled to a rope brake dynamometer having a radius of 400 mm. At 3200 RPM with all cylinders firing the net load is 350 N. when each cylinder is cut off the average net brake load produced at the same speed by the remaining five cylinders is 250 N. Estimate the indicated mean effective pressure of the engine. With all cylinders in operation the fuel consumption is 0.33 kg/hr. The calorific value of fuel is 43 MJ/kg. The cooling water flow rate is 70 kg/min and the temperature rise is 10°C. During test the engine is enclosed in a box and ventilating air is blown up through the box at a rate of 15 kg/min at 17 °C. The air leaves the box at 62°C. Draw heat balance sheet for the engine on minute basis. 12
5. (a) A six cylinder four stroke diesel engine operates at air fuel ratio of 20:1. The diameter and stroke of the cylinder are 100 mm and 140 mm respectively. The volumetric efficiency is 80 %. The condition of air at the beginning of compression are 1 bar and 27°C. Determine the maximum amount of fuel that can be injected in each cylinder per second. If the speed of the engine is 1500 RPM, injection pressure is 150 bar, air pressure during fuel injection is 20 bar and the fuel injection is carried out for 20 degrees of crank rotation, determine the diameter of fuel nozzle. 10
- (b) Describe in brief the methods of turbo charging. 10
6. Write a short note on (Any four) :— 20
- Types of diesel fuel Injection nozzles
 - Use of ballast resistor and capacitor in ignition system
 - Variable compression ratio engine
 - SAE ratings of lube oils
 - Exhaust gas recirculation.

