Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

CPME 6304 (Old)

Sixth Semester (Back) Examination – 2013

INTERNAL COMBUSTION ENGINES AND GAS TURBINES

BRANCH : MECH

QUESTION CODE : B357

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (a) What do you mean by mechanical efficiency ? How is it different from thermal efficiency ?

   (b) On the basis of same maximum pressure and temperature, compare Otto, Diesel and Dual cycle.

   (c) Draw, p-v and T-s diagram for Diesel engine.

   (d) Write down whether intensity of knock increase or decrease when following factors increase. (i) compression ratio, (ii) octane number, (iii) engine temperature, (iv) turbulence.

   (e) Name the different types nozzles used in fuel injection system.

   (f) How CI engine fuels are rated ?

   (g) What is octane number ?

   (h) Draw the p-v and T-s diagram for Brayton cycle.

   (i) What is the effect of intercooling and reheating on efficiency of Brayton cycle ?

   (j) What is cut-off ratio in Diesel engine ?

2. (a) What is the difference between air cycle and fuel-air cycle ? 5

   (b) In an ideal constant volume cycle the pressure and temperature at the beginning of compression are 97 kN/m^2 and 40°C, respectively. The volume

ratio of compression is 7 : 1. The heat supplied during cycle is 1200 kJ/kg of working fluid. Determine (i) the maximum temperature attained in the cycle, (ii) the thermal efficiency, (iii) the work done during the cycle/kg of working fluid. 5

3. (a) Compare the relative merits and demerits of four stroke and two stroke engine. 5

   (b) Describe with neat sketch the working of four stroke petrol engine. 5

4. The air flow to a four cylinder four stroke petrol engine is measured by means a 7.5 cm diameter sharp edged orifice, Cd = 0.6. During a test on the engine following data were recorded.

   Bore = 11 cm, stroke = 13 cm, engine speed = 2250 rpm, brake power = 36 kW, fuel consumption = 10.5 kg/h, calorific value = 42000 kJ/kg. Pressure drop across orifice = 4.1 cm of water. Atmospheric pressure and temperature are 1.013 bar and 15°C.

   Calculate : (i) thermal efficiency on b.p. basis, (ii) brake mean effective pressure, (iii) Volumetric efficiency based on free air conditions. 10

5. (a) Describe with suitable sketches the combustion phenomenon in SI engines, and explain the two phases of combustion. 5

   (b) Explain the stages of combustion in a CI engine. 5

6. (a) Sketch and explain the simple carburetor system. 5

   (b) Describe different types of injection nozzles and discuss their relative merits and demerits. 5

7. (a) Discuss relative merits and demerits of closed cycle and open cycle gas turbines. 5

   (b) With neat sketch, explain the working principle of a Ramjet engine. 5

8. Write short notes on any **two** of the following : 5×2

   (a) Comparison of SI and CI engine

   (b) Lubrication system of 4-stroke SI engine

   (c) Actual valve timing diagram of 4-stroke SI engine

   (d) Water cooling system of 4-stroke CI engine.
