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

Total number of printed pages – 4

B. Tech

PCME4302

Fifth Semester Examination – 2013

I.C. ENGINES AND GAS TURBINES

BRANCH : MECH

QUESTION CODE : C-374

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) Why all high power marine engines are two-stroke diesel engines ?

(b) Draw the theoretical and actual valve timing diagram of a four-stroke petrol engine.

(c) What is a duel fuel engine ?

(d) State the difference between lean burn and stratified charged engine.

(e) Define equivalence ratio. What is its value for lean and rich mixture ?

(f) What is exhaust blow down? Is it essential for an internal combustion engine ?

(g) Draw P-θ diagram and show ignition delay of a CI engine on it.

P.T.O.

(h) Define mean effective pressure. What is its significance ?

(i) Name four different methods used to determine friction power.

(j) Name four main losses that makes a practical gas turbine cycle different from ideal one.

2. (a) Compare the SI and CI engines on the basis of performance characteristics. 5

(b) How a actual cycle differs from fuel-air cycle ? Explain, in brief, about the affecting factors. 5

3. (a) What is rating of IC engine fuels ? Explain how SI engine fuels are rated. 5

(b) What is carburetion ? Explain with neat diagrams how mixture requirement during idling and cruising meet by a modern carburetor. 5

4. Air consumption for a four-stroke petrol engine is measured by means of a circular orifice of diameter 30 mm. The coefficient of discharge for the orifice is 0.63 and the pressure across the orifice is 155 mm of water. The barometer reads 750 mm of Hg. Temperature of air in the room is 37°C. The piston displacement volume is 1780 cc. The compression ratio is 6.8. The fuel consumption is 8 kg/hr and having heating value of 43.6 MJ/kg. The brake power developed at 2500 rpm is 28 kW. Determine :

(a) The Volumetric efficiency on the basis of air alone

(b) The air to fuel ratio

(c) The brake mean effective pressure

(d) The relative efficiency on the brake thermal efficiency basis. 10

5. (a) Distinguish the combustion between SI and CI engine. Explain different stages of combustion in CI engines. 5

(b) How abnormal combustion occurs in SI engine ? Explain, in brief, different engine variables that cause abnormal combustion and the methods to suppress that. 5

6. a) What is supercharging of IC engines ? Explain with neat diagram different methods of supercharging. Explain the factors that limit the extent of supercharging of SI and CI engines. 5

(b) Name different pollutants present in SI engine exhaust. Briefly explain their formation and control techniques. 5

7. (a) A turbojet engine consume air at the rate of 60.2 kg/s when flying at a speed of 1000 km/hr. Calculate

(i) the exit velocity of the jet when the enthalpy change for the nozzle is 230 kJ/kg and velocity coefficient is 0.96.

(ii) Thrust specific fuel consumption

(iii) Propulsive power

(iv) Propulsive efficiency 5

(b) A centrifugal compressor has a pressure ratio of 4:1 with an isentropic efficiency of 80% when running at 15000 rpm and inducting air at 239 K.. Curved vanes at inlet give the air a prewhirl of 25 degrees to the axial direction at all radii and the tip diameter of the eye is 250 mm. The absolute velocity at the inlet is 150 m/s and the impeller diameter is 600 mm. Calculate the slip factor. 5

8. (a) Distinguish between battery ignition and Magneto ignition

(b) Engine modification of existing CI engine to run with CNG as fuel

(c) Effect of cooling on engine power output and efficiency

(d) CI engine combustion chamber. 2.5 × 4
