Code: 15A03403

R15

B.Tech II Year II Semester (R15) Regular Examinations May/June 2017
THERMAL ENGINEERING – I
(Mechanical Engineering)

Time: 3 hours   Max. Marks: 70

PART – A
(Compulsory Question)
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1   Answer the following: (10 X 02 = 20 Marks)
   (a)   What are the basic components of IC engine?
   (b)   Define compression ratio.
   (c)   What is bleeding in injection system?
   (d)   How the pistons usually lubricated.
   (e)   What is meant by ignition lag in SI engine?
   (f)   List out the factors effecting in detonation.
   (g)   Define volumetric efficiency of an engine.
   (h)   What is meant by specific fuel consumption?
   (i)   How are compressor classified?
   (j)   What are the advantages of multistage compression over a single stage compression for the same compression ratio?

PART – B
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2   Explain the construction and working principle of a four stroke gasoline engine with neat sketch.

OR

3   Discuss the difference between ideal and actual valve timing diagrams of a petrol engine.

UNIT – II

4   Explain the working of magneto-ignition system used in petrol engine.

OR

5   What are the various desired properties of a lubricant and explain how additives help to achieve the desired properties?

UNIT – III

6   Briefly explain the stages of combusting in SI engines elaborating the flame front propagation.

OR

7   Explain the factors affecting delay period in CI engine.

UNIT – IV

8   Following observations were recorded during a test a single-cylinder oil engine: Bore = 300 mm, stroke = 450 mm, speed = 300 r.p.m, i.m.e.p = 6 bar, net brake load = 1.5 kN, brake drum diameter = 1.8 meter, brake rope diameter = 2 cm. Calculate: (i) Indicator power. (ii) Brake power. (iii) Mechanical efficiency.

OR

9   A four cylinder four-stroke SI engine has a compression ratio of 8 and bore of 100 mm, with stroke equal to the bore. The volumetric efficiency of each cylinder is equal to 75%. The four stroke SI engine operates at a speed of 4800 r.p.m with an air-fuel ratio 15. Given that the calorific value of fuel = 42 MJ/kg, atmospheric density = 1.12 kg/m^3, mean effective pressure in the cylinder = 10 bar and mechanical efficiency of the engine = 80%. Determine the indicated thermal efficiency and the brake power.

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UNIT – V

10   Derive an expression for volumetric efficiency of air compressor.

OR

11   A two-stage single-acting reciprocating compressor takes in air at the rate of 0.2 m^3/s. The intake pressure and temperature of air are 0.1 MPa and 16℃. The air is compressed to a final pressure of 0.7 MPa. The intermediate pressure is ideal and inter-cooling is perfect. The compression index in both the stages is 1.25 and the compressor runs at 600 r.p.m. Neglecting clearance, determine:

  (i) The intermediate pressure.
  (ii) The total of each cylinder.
  (iii) The power required to drive the compressor.
  (iv) The rate of heat rejection in the intercooler.

 Take Cp = 1.005 kJ/kg K and R = 0.287 kJ/kg K.

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