

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)

- 1 Answer the following: (10 X 02 = 20 Marks)
- What are the basic components of IC engine?
 - Define compression ratio.
 - What is bleeding in injection system?
 - How the pistons usually lubricated.
 - What is meant by ignition lag in SI engine?
 - List out the factors effecting in detonation.
 - Define volumetric efficiency of an engine.
 - What is meant by specific fuel consumption?
 - How are compressor classified?
 - 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/m³, mean effective pressure in the cylinder = 10 bar and mechanical efficiency of the engine = 80%. Determine the indicated thermal efficiency and the brake power.

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 $0.2 \text{ m}^3/\text{s}$. The intake pressure and temperature of air are 0.1 MPa and 16°C . 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 $C_p = 1.005 \text{ kJ/kg K}$ and $R = 0.287 \text{ kJ/kg K}$.
