

B.Tech II Year II Semester (R15) Supplementary Examinations December 2018

THERMAL ENGINEERING – I

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

1 Answer the following: (10 X 02 = 20 Marks)

- (a) What is meant by “pumping loss” in an I.C engine?
- (b) Draw port timing diagram of a two stroke petrol engine.
- (c) Write functions of carburetor in S.I engine.
- (d) Is fuel injection system used in latest petrol engines? Give brief description.
- (e) What is pre ignition?
- (f) List some anti knocking additives.
- (g) Where is frictional power accounted in heat balance sheet?
- (h) Define brake specific fuel consumption and brake power.
- (i) Define isothermal efficiency of compressor.
- (j) What do you understand by slip in centrifugal compressor?

PART – B

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

UNIT – I

- 2 (a) Compare diesel engines with petrol engines.
- (b) Explain the working of four stroke petrol engine with a neat sketch.

OR

- 3 (a) Explain the working of two stroke diesel engine with a neat sketch.
- (b) Differentiate between valve timing and port timing diagrams.

UNIT – II

- 4 (a) With the aid of a sketch, explain the mixture requirements of an automotive engine under:
 - (i) Idling range.
 - (ii) Normal running.
 - (iii) Power range.
- (b) Compare between battery Ignition and magneto ignition regarding:
 - (i) Quality of spark.
 - (ii) Maintenance.

OR

- 5 (a) Explain cooling systems used in I.C engines.
- (b) Describe working of MPFI.

UNIT – III

- 6 (a) Explain various stages of combustion in S.I engines with the help of P- θ diagram.
- (b) What do you mean by 'octane number' and cetane number of fuel?

OR

- 7 (a) What are the factors effecting the delay period in CI engine?
- (b) Explain briefly about F type combustion chamber used in SI engines.

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R15**UNIT – IV**

- 8 The following data refers to 2 – stroke oil engine:
- Bore = 100 mm
 - Stroke = 150 mm
 - Piston speed = 300 m/min
 - Torque developed = 60 N-m
 - Mechanical efficiency = 90%
 - Indicated thermal efficiency = 42%
 - C.V. = 45500 kJ/kg
- Find: (i) Indicated power (IP). (ii) IMEP. (iii) BSFC. (iv) F.P.

OR

- 9 (a) What are the instruments or equipment used for measuring the following parameters of an I.C engine?
- (i) Brake power.
 - (ii) No emissions.
 - (iii) Air flow rate.
 - (iv) Pressure of combustion gases.
- (b) A six-cylinder petrol engine operates on four-stroke cycle. The bore of each cylinder is 70 mm and stroke 100 mm. The clearance volume per cylinder is 67 cc. At a speed of 4000 rpm, the fuel consumption is 20 kg/h and the torque developed is 150 Nm. If C.V = 44000 kJ/kg, calculate:
- (i) Brake power. (ii) Bmep. (iii) Brake thermal efficiency.

UNIT – V

- 10 (a) Distinguish between rotary and reciprocating air compressors.
- (b) Draw p-v diagrams for a single stage double acting reciprocating air compressor having the same inlet and delivery pressures at both ends of cylinder.
- OR**
- 11 A single acting two stage, reciprocating air compressor takes in air at 1.013 bar and 15°C at a mass flow rate of 5 kg/min. The clearance volumes of both the stages is 6% of respective swept volumes. The law of compression is $PV^{1.3} = \text{Constant}$ for both the stages. The compressor runs at 360 rpm. Overall pressure ratio for two stages is 9. Inter cooling is assumed to be perfect. Calculate: (i) Cylinder swept volumes required.
- (ii) Indicated power.
 - (iii) Saving in work in comparison with single stage compression.
- Take $R_g = 287 \text{ J/kg}^\circ\text{K}$ and $\gamma = 1.4$.
