



SEM 2-4 (RC 07 – 08)

F.E. (Semester – II) Examination, May/June 2015
BASIC MECHANICAL ENGINEERING (Revised in 2007-08)

Duration : 3 Hours

Total Marks : 100

- Instructions :** 1) Answer **five** questions in **all** selecting atleast **one** question from **each** Module.
2) Use of thermodynamic tables and charts in **permitted**.
3) **Assume** missing data, if any, with proper justification.

MODULE – I

1. A) 0.08 m^3 of an ideal gas at 300 K and 2 bar is compressed reversible adiabatically to 10 bar. It is then cooled at constant pressure and expanded isothermally so as to reach the condition from where it started.

- Show the process on P-V plane
- Cardinal points (P, V and T at each point on the cycle)
- Find the heat and work transfer for each process
- Find the change in enthalpy and internal energy in each process
- Find the ratio of network transfer to net heat transfer. Comment on the result (Assume $c_p = 7.272 \text{ kJ/kg-K}$ and $c_v = 5.196 \text{ kJ/kg-K}$)

B) With the help of a P-V diagram, describe the various processes that constitute the air standard diesel cycle.

C) What is a turbine ? Derive the expression for first law of thermodynamics applied to a turbine.

(10+5+5)

2. A) Give statements of second law of thermodynamics. Assign an equivalent mathematical expression to each statement and discuss.

B) Differentiate between the following :

- Extensive and intensive properties
- Point and path functions

C) What is a thermodynamic cycle ? How are internal combustion engines modelled ?

P.T.O.



D) In an air standard Otto cycle, the compression starts at NTP. The maximum pressure and temperature of the cycle are 50 bar and 1800 K respectively. Drawing the P-V diagram, find the following :

- i) P, v and T at various salient points of the cycle
- ii) Compression ratio
- iii) Air standard efficiency
- iv) Heat and work transfer in each process.

(5+3+4+8)

MODULE – II

- 3. A) Write a short note on vapour compression refrigeration system.
 - B) Explain the working principle of basic Rankine cycle used in steam power plant with the help of a schematic diagram.
 - C) With a help of a neat sketch, describe various parts of an I.C. engine.
- (7+7+6)
- 4. A) Describe MPFI system with appropriate sketches.
 - B) Explain the working of an ignition system in an SI Engine.
 - C) A 4 stroke single cylinder SI engine of 300 mm bore and 400 mm stroke runs at an average piston speed of 10 m/s. The engine has a clearance volume of 3600 cc. The engine develops 60 kW indicated power, find the mean effective pressure and crankshaft speed. Find the air standard efficiency of the cycle.
- (6+6+8)

MODULE – III

- 5. A) Explain with a neat sketch, the construction and working of hydraulic steering system.
 - B) What is clutch ? Where is it located ? What are the requirements of a good clutch ?
 - C) What are the main components of an automobile ? Describe them briefly.
- (7+6+7)
- 6. A) How is the length of the propeller shaft varied automatically ?
 - B) With neat sketch, explain the layout and working of air brake system.
 - C) What are the functions of transmission box ? With a neat sketch explain, the construction and working of constant mesh gear box.
- (4+8+8)



MODULE – IV

7. A) Compare between :

- i) Open and closed die forging
- ii) Direct and indirect extrusion process
- iii) 2-high and 3-high rolling mills.

B) Briefly explain the procedure to be followed for making a sand mould.

C) Explain up-milling and down-milling operations with neat sketches.

(9+5+6)

8. A) What is a pattern ? Discuss the different types of patterns with neat sketches.

B) Write short notes on :

- i) Soldering
- ii) Brazing

C) Explain laser beam welding process with a neat sketch.

(8+6+6)