SEM 2 – 4 (RC 07-08)

F.E. (Semester – II) (Revised 07-08) Examination, November/December 2016
BASIC MECHANICAL ENGINEERING

Duration : 3 Hours | Max. Marks : 100

Instructions : *1) Attempt in **all five** questions. At least **one** question to be attempted from **each** Module.*
*2) Assume missing data, if **any** with proper justification.*
*3) Illustrate with **neat** sketches where appropriate.*

MODULE – I

1. a) Air initially at 60 kPa Pressure, 800 K temperature and occupying a volume of 0.1 m^3 is compressed isothermally until the volume is halved and subsequently it goes further compression at constant pressure till the volume is halved again. Sketch the process on P-v plot and calculate total work done and heat interaction for the two processes. Assume ideal gas behavior for air and take C_p = 1.005 kJ/kg K and C_v = 0.718 kJ/kg K. **10**

   b) Explain the concept of absolute temperature scale. **4**

   c) What is the difference between extensive and intensive properties ? **3**

   d) What do you understand by "Internal energy" of a system ? **3**

2. a) An engine working on ideal Otto cycle has temperature and pressure at the beginning of compression as 25°C and 1.5 bar respectively. The peak pressure is 35 bar. If the thermal efficiency of the engine is 48% and γ = 1.4. Determine the pressure and temperatures at salient points. **10**

   b) Derive the expression for the first law of thermodynamics applied to a boiler. **4**

   c) What are point and path functions ? Give some examples. **3**

   d) How do we distinguish between work transfer and heat transfer. **3**

MODULE – II

3. a) A 4-stroke six cylinder engine has a bore of 80 mm and stroke of 100 mm while running at a speed of 3750 rpm, its fuel consumption is 20 kg/hr and develops a braking torque of 150 N-m. Assuming a clearance volume of 75 cm^3 per cylinder, determine
   i) brake power
   ii) brake specific fuel consumption
   iii) brake thermal efficiency if the calorific value of fuel is 42.5 MJ/kg and
   iv) compression ratio. **8**

P.T.O.

b) Explain the working of a steam power plant with neat schematic diagram. 6

c) Differentiate between air cooling and water cooling system in an IC engine. 4

d) Explain the term refrigeration. 2

4. a) Describe the working of a four-stroke SI engine with a neat diagram. 8

b) With the help of neat sketch explain the working of vapour compression refrigeration system in a domestic refrigerator. 6

c) Write a short note on Multi-Point Fuel Injection (MPFI). 4

d) What do you understand by the term 'latent heat'. 2

MODULE – III

5. a) Draw the layout circuit of air brake system and explain its working. 8

b) Explain the working principle of hydraulic steering system. 6

c) Write a short note on emission control in automobiles. 6

6. a) Explain the construction and working of differential in an automobile. 8

b) With a neat sketch, explain single plate clutch. 6

c) Give a brief classification of automobiles. 6

MODULE – IV

7. a) Describe the basic operations performed on a centre lathe. 6

b) Write a short note on adhesive bonding. 5

c) What are the main differences between hot and cold chamber die casting ? 5

d) Compare open die drop forging with closed die drop forging. 4

8. a) Describe the basic steps involved in sand casting. 6

b) Write a short note on tube bending. 5

c) Compare hot and cold extrusion operation. 5

d) Describe the relative motion between the workpiece and the tool with neat sketches for the following process : 4

i) Drilling and ii) Milling.