



SEM 2 – 4 (RC 07-08)

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

Duration : 3 Hours

Max. Marks : 100

- Instructions :** 1) Attempt in **all five** questions. Atleast **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) One kg of air at 1 bar and 27° C is compressed isothermally to one-fifth of the original volume. It is then heated at constant volume to a condition such that reversible adiabatic expansion from that state will return the system to the original state. Determine the pressure and temperature at the end of constant volume heating. Represent the process on the pressure-volume diagram. Also determine network done during the cycle. Take $\gamma = 1.4$ and $R = 287 \text{ J/kg K}$ for air. 10
- b) List the assumptions made in the analysis of air standard cycles. 5
- c) Explain the zeroth law of thermodynamics. How is it associated with temperature measurement ? 5
2. a) In a S.I. engine working on an ideal Otto cycle, the compression ratio is 5.5. The pressure and temperature at the beginning of compression are 1 bar and 27° C respectively. The peak pressure is 30 bar. Determine the pressure and temperatures at salient points and the air-standard efficiency. Assume ratio of specific heats for air to be 1.4. 10
- b) Derive the expression for the first law of thermodynamics applied to a turbine. 5
- c) What is the difference between an isothermal and adiabatic process ? Compare the two processes on a P-v diagram. 5



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 cm³ 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
- b) Describe the multi-point fuel injection system with a neat sketch. 6
- c) What are the drawbacks of conventional ignition system ? 4
- d) Define tonne of refrigeration. 2
4. a) Describe the working of a four-stroke CI engine with a neat diagram. 8
- b) Explain in brief the methods of IC engine cooling. 6
- c) Describe the basic Rankine cycle with the help of P-v diagram. 4
- d) Define brake specific fuel consumption. 2

MODULE – III

5. a) Elaborate the main components of an automobile. 10
- b) Explain rack and pinion steering system. 6
- c) Write a short note on automotive emissions and their control. 4
6. a) Explain the construction and working of constant mesh gear box. 10
- b) Write a short note on universal joint. 6
- c) State the advantages of air brake system over conventional brake system. 4

MODULE – IV

7. a) With a neat sketch explain sheet metal stretch forming. 8
- b) How is brazing different from welding ? 4
- c) Write a short note on : 8
- i) Open die forging ii) Impact extrusion
8. a) Explain with a neat sketch true centrifugal casting process. 6
- b) Explain briefly with the help of neat sketch the following operations on lathe : 6
- i) Turning ii) Facing iii) Knurling
- c) Write a short note on : 8
- i) Laser beam welding ii) Hydrostatic extrusion