SEM 2 – 4 (RC 07-08)

F.E. (Semester – II) Examination, May/June 2013
(Revised 2007-08)
BASIC MECHANICAL ENGINEERING

Duration : 3 Hours

Max. Marks : 100

Instructions : *1) Answer **five** questions in all selecting atleast **one** question from **each** Module.*
*2) **Assume** missing data, **if any** with proper justification.*
3) Appropriate visuals will be part of the weightage assigned to a question.

Module – I

1. A) Answer the following : **(3+4+3)**

i) Apply non flow energy equation (NFEE) to an isolated system and hence comment on the result.

ii) Giving the symbolic representation of boiler, apply first law on it.

iii) Explain the sign convention of work and heat.

B) 0.5 kg of air at 600 kPa receives an addition of heat at constant volume so that its temperature rises from 110°C to 650°C. It then expands in a cylinder reversibly and adiabatically to its initial temperature. Finally, it is compressed isothermally to its original state. Representing the cycle on P-V plane compute the following :

i) Comment on the nature of the final process

ii) Find heat and work transfers in each process

iii) Find the changes in internal energy and enthalpy in each process

iv) Find the ratio of cyclic work transfer to heat added on the cycle. **10**

2. A) Answer the following : **(3+5)**

i) Prove that for a practical heat engine efficiency will be always a fraction and non-negative.

ii) Explain the concept of absolute temperature scale.

B) In an air standard Diesel cycle, the compression ratio is 15. The compression begins at 0.1 MPa, 27°C. The heat added is 1.7 MJ/kg. representing the cycle in P-V co-ordinates, compute the following :

i) The network done in the cycle per kg of air

ii) Air standard efficiency

iii) Power developed if the engine completes 500 cycles per minute

iv) Maximum theoretical efficiency

v) Pressure and temperature in all corner points of the cycle. 12

Module – II

3. A) A two stroke CI engine delivers a brake power of 368 kW while 73.6 kW is used to overcome the frictional losses. It consumes 180 kg/h of fuel (TFC) at an air-fuel ratio of 20:1. The heating value of the fuel is 42000 kJ/kg. Calculate the following :

i) Indicated power

ii) Specific fuel consumption

iii) Air consumption

iv) Brake thermal efficiency. 8

B) Answer the following : (6+6)

i) With neat sketch explain the working principle of 4-stroke CI engine.

ii) Give list of basic parts and nomenclature of an.I.C engine highlighting its fundamental utility.

4. A) Answer the following : (6+4)

i) With the help of appropriate sketch explain the working of basic Rankine cycle.

ii) Explain latent heat. During this heat addition process what happens to pressure and temperature of the system ? How will you relate dryness fraction to latent heat ?

B) Answer the following : (6+4)

i) With the help of appropriate sketch explain the working of basic vapour compression refrigeration system employed in a domestic refrigerator.

ii) Write a descriptive note on refrigerants.

Module – III

5. A) Elaborate the main components of an automobile. 8

   B) With a neat sketch explain the layout and working of air brake system. 8

   C) How is the length of propeller shaft varied automatically ? 4

6. A) Explain the construction and working of a differential with a neat sketch. 8

   B) Explain rack and pinion steering system with a neat sketch. 6

   C) Give the classification of automobiles. 6

Module – IV

7. A) With a neat sketch explain true centrifugal casting process. 5

   B) Explain hydrostatic extrusion process with a neat sketch. Is it forward or backward extrusion ? 5

   C) Explain Up-milling and down milling with neat sketches. 6

   D) Distinguish between brazing and soldering. 4

8. A) Explain the principle of rolling. Sketch the various roll arrangements used in rolling mills. 8

   B) Explain any three operations that can be performed on a lathe with neat sketches. 6

   C) Explain sheet metal spinning process with a neat sketch. 6