FIRST SEMESTER

Roll No. x86/CE/038

B.Tech.(Group-B)

END SEMESTER EXAMINATION

NOVEMBER-2010

ME- 115 BASIC MECHANICAL ENGINEERING

Time: 3 Hours

Max. Marks : 70

> **Note :** Answer *FIVE* questions in all selecting at least *TWO* questions from each part.
>
> Answer Part A and Part B in order of their appearance in Q. Paper.
>
> Assume suitable missing data, if any.

Part-A

1[a] Define and explain the following:-

   (i) Thermodynamic equilibrium

   (ii) Second law of thermodynamics

   (iii) Concept of available and unavailable energy.

   (iv) Clausius inequality.

[b] Air flows steadily at the rate of 0.5 kg/s through an air compressor, entering at 7 m/s velocity, 100 Kpa pressure and 0.96 m^3/kg volume and leaving at 5 m/s 700 KPa and 0.19m^3/kg. The internal energy of air leaving is 90KJ/kg greater than that of air entering. Cooling water in compressor Jackets absorbs heat from inlet air at the rate of 58KW. (i) Compute the rate of shaft work input to air in KW. (ii) Find the ratio of inlet pipe diameter to outlet pipe diameter.

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2[a] A reversible heat engine operates between two reservoirs at temperature of 600°C and 40°C. The engine drives reversible refrigerator which operates between reservoirs at temperatures of 40°C and -20°C. The heat transfer to heat engine is 2100KJ and net work output of combined engine refrigerator plant is 350 KJ. Evaluate the heat transfer to the refrigerant and the net heat transfer to reservoir at 40°C.

7

[b] In a Diesel cycle, the pressure and temperature at beginning are 1 bar and 303 K respectively. The compression ratio is 16. The cut-off ratio is 2.5. Calculate maximum pressure and maximum temperature in the cycle also calculate efficiency of cycle. Assume C_p = 1 KJ/kgK and C_v = 0.715 KJ/kg-K

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3[a] Prove that entropy is a property of a system. Air of 5 kg at a temperature of 300K and 2 bar pressure is compressed at constant volume to a pressure of 5 bar. Calculate the change in entropy. Given C_p= 1.005 KJ/kgK, C_v= 0.718 KJ/kgK. 7

[b] (i) Define and explain Newton Law of viscosity. 7

(ii) The dynamic viscosity of an oil for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4m and rotates at 190 r.p.m. Calculate the power lost in bearing for a sleeve length of 90 mm. The thickness of a oil film is 1.5mm. 7

4[a] Derive an expression for the pressure force on the vertical surface submerged in fluid. Also locate the position of centre of pressure. 7

[b] The water is flowing through a pipe having diameters 20 cm and 10 cm at section 1 and 2 respectively. The rate of flow through pipe is 40 litres/s. The section 1 is 7 m above the datum and 2 is 3 m above the datum. If pressure at inlet section 1 is 40 N/cm². Find the pressure at section 2. 7

Part-B

1[a] What is pattern? What are various allowances? Why are allowances necessary for pattern making? Name the types of moulding boxes. 7

[b] With the help of neat sketches discuss the equipments required for oxyacetelene welding. How are neutral, oxydising and reducing flames obtained in welding torch? 7

2[a] What is the principle of electric arc welding? Explain the term polarity indicating advantages and disadvantages of different polarities. 7

[b] Draw a neat diagram of a lathe machine showing various parts. 4

[c] Explain the working principle of shaper machine. 3

3[a] Explain briefly the following:

(i) Line Standards (ii) End standards 4

[b] Explain construction and working of micrometer with the help of neat sketch. 5

[c] What is a comparator? How are comparator classified? Explain any one mechanical compactor. 5

4 Write short notes on any TWO of the following:

(i) CNC (ii) EDM (ii) CHM (iv) SMT 2x7=14