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BME-052

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DIPLOMA IN MECHANICAL ENGINEERING/ ADVANCED LEVEL CERTIFICATE IN MECHANICAL ENGINEERING (DMEVI/ACMEVI)

Term-End Examination

June, 2012

BME-052 : BASICS OF THERMAL ENGINEERING

Time : 2 hours *Maximum Marks : 70*

*Note : Answer **any seven** questions. Each question carry **10** marks. Use of scientific calculator is permitted. Use of steam tables, Mollier diagram are permitted.*

1. What is thermodynamics ? Define the concept of system. Explain the difference between a closed system and open system. Give examples. **10**

2. 1 kg of gaseous CO_2 contained in a closed system undergoes a reversible process of constant pressure. During this process 42 kJ of internal energy is decreased. Determine the work done during the process. C_P = 840J/kg°C and C_v = 600J/kg°C. **10**

3. Air at 1.02 bar, 22°C, initially occupying a cylinder volume of 0.015m^3, is compressed reversibly and adiabatically by a piston to a pressure of 6.8 bar. Calculate : **10**

(a) The final temperature

(b) Final Volume; and

(c) The work done.

4. Nitrogen gas is compressed in a reversible process in a cylinder from 100 kPa, 20°C to 500 kPa. During the compression process the relation between pressure and volume is $P.V^{1.3} = C$. Calculate : **10**

(a) Work done and heat transfer per kg, and.

(b) Change in entropy during this process.

Assume R = 296.8 J/kgK and C_V = 744.8 J/kgK for nitrogen gas.

5. A rigid vessel having a volume of 5m^3 contains 0.05 m^3 of saturated liquid water and the rest of the volume as saturated vapour at 0.1MPa, Heat is transfered until the vessel is filled with dry saturated vapour. Determine the heat transfer and work done during the process. **10**

6. Explain the working principle of a Cochran Boiter with neat diagram. **10**

7. Draw a sketch of a pressure compounded impulse turbine and explain its working. **10**

8. Briefly describe the construction and working of any one type of induced draft type cooling tower. **10**

9. The inner surface of a plane brick wall is at 40°C and the outer surface is at 20°C. Calculate the rate of heat transfer per m^3 of a surface area of the wall, which is 250 mm thick. The thermal conductivity of the brick is 0.52 W/mK. **10**

10. Describe the construction of solar flat plate collector and solar cells. **10**