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B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering) B.Tech. (Aerospace Engineering)

Term-End Examination

June, 2012

ET-201(B) : ENGINEERING THERMODYNAMICS

Time : 3 hours *Maximum Marks : 70*

*Note : Answer **any seven** questions. All questions carry **equal** marks. Use of steam tables and calculator is permitted.*

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1. (a) A force of 1500 N is applied uniformly on a piston of 15 cm diameter in the direction normal to the piston. Find the pressure on the piston. **4+6**

(b) A U-tube manometer is connected to a gas pipe. The level of the liquid in the manometer arm open to the atmosphere is 170 mm lower than the level of the liquid in the arm connected to the gas pipe. The liquid in the manometer has specific gravity of 0.8. Find the absolute pressure of the gas if the barometer reads 760 mm of Hg.

2. (a) 1 kg of gaseous CO_2 contained in a closed system undergoes a reversible process at constant pressure. During this process internal energy decreases by 42 kJ. Determine the work done during the process. **5+5**

Take C_p = 840 J/kg°c and C_v=600 J/kg°c.

(b) A heat engine recieves heat at the rate of 1500 kJ/min and gives an output of 8.2 kW. Determine :

(i) Thermal efficiency and

(ii) Rate of heat rejection.

3. (a) Explain the working principle of 'Refrigerator ' with suitable schematic diagram of a refrigerator. **5+5**

(b) Draw schematic of Steam Power Plant and explain the working of Steam Power Plant.

4. A cyclic heat engine operates between a source temperature of 1000° C and a sink temp of 40° C. Find the least rate of heat rejection per kW net output of the engine. **10**

5. In a Steam Power Plant the work output of the turbine is 200 kJ while heat supplied at the boiler is 400 kJ. Given that during the same period work input to the pump is 0.7 kJ, find the heat rejected at the condenser and thermal efficiency of the plant. **10**

6. (a) Define entropy and also write the equation for change in entropy. **4+3+3**

   (b) Explain about reversible and irreversible adiabatic processes.

   (c) Explain about available and unavailable energy.

7. The volume of a high altitude chamber is 40 m^3. It is put in to operation by reducing pressure from 1 bar to 0.4 bar and temperature from 25°C to 5°C. How many kg of air must be removed from the chamber during the process ? Express this mass as a volume measured at 1 bar and 25°c. **10**

   Take R = 287 J / kgK for air.

8. A Pressure Cooker contains 1.5 kg of saturated steam at 5 bar. Find the quantity of heat which must be rejected so as to reduce the quality to 60% dry ? Determine the pressure and temperature of the steam at the new state. **10**

9. A refrigerating system operates on the reversed carnot cycle. The higher temperature of the refrigerant in the system is 35°C and the lower temperature is -15°C. The capacity of the refrigeration system is 12 TR. Neglect all losses. Determine : **10**

(a) Co - efficient of performance

(b) Heat rejected from the system per hour.

(c) Power required.

10. Write short notes on *any four* of the following :

(a) Fossil fuel resources **4x2½=10**

(b) Principles of energy conservation

(c) Combustion efficiency

(d) Role of the energy Manager

(e) Throttling Process

(f) Intercooling.