Code: 9A03302

R09

II B. Tech I Semester (R09) Supplementary Examinations, May 2012

THERMODYNAMICS

(Common to AE, ME)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) Define a thermodynamic system. Differentiate between open system, closed system and an isolated system.

(b) Determine the work done by the air which enters into an evacuated vessel from atmosphere when the valve is opened. The atmospheric pressure is 1.013 bar and 1.5 m^3 of air at atmospheric condition enters into the vessel.

2 (a) State the zeroth law of thermodynamics. Explain how it forms the basis for temperature measurement.

(b) A closed system undergoes a thermodynamic cycle consisting of four separate and distinct processes. The heat and work transferred in each process are as tabulated below.

Process	Heat transfer in Kj/min	Work done in Kj/min
1-2	20,000	0
2-3	-10,000	30,000
3-4	0	20,000
4-1	15,000	-25,000

Show that the data is consistent with the first law of thermodynamics. Also evaluate the net work output in KW and the change in internal energy.

3 (a) State and explain second law of thermodynamics.

(b) 4 kg of air is compressed in a reversible steady flow polytrophic process ($PV^{1.25}$= C) from 1 bar and 30^0 C to 10 bar. Calculate the work input, heat transferred and the change in the entropy.

4 (a) Describe the process of formation and give its graphical representation.

(b) Steam enters an engine at a pressure 10 bar absolute and 250^0 C. It is exhausted at 0.2 bar. The steam at exhaust is 0.9 dry. Find: (i) Drop in enthalpy. (ii) Change in enthalpy.

5 Derive the work transfer equations for various Quasi-static processes.

6 35 two tanks are connected by a valve. One tank contains 2 kg of CO_2 gas at 77^0 C and 0.7 bar. The other tank holds 8 kg of the same gas at 27^0 C and 1.2 bar. The valve is opened and the gases are allowed to mix while receiving energy by heat transfer from the surroundings. The final equilibrium temperature is 42^0C. Using the ideal gas model, determine:
(i) The final equilibrium pressure. (ii) Heat transfer for the process.

7 (a) What do you mean by adiabatic mixing of air streams? Show the process on a psychrometric chart.

(b) What is the basic difference between refrigeration and air-conditioning? Explain the parameters involved in the air-conditioning processes.

8 (a) What do you mean by air standard cycles? What are the assumptions for an air standard cycle?

(b) Derive an expression for an air standard efficiency of Otto cycle.

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