Code No. : 3288

FACULTY OF ENGINEERING

B.E. 2/4 (M/P) II Semester (Main) Examination, May/June 2011

THERMODYNAMICS

Time : 3 Hours] **[Max. Marks : 75**

Note : Answer **all** questions from Part – A. Answer any **five** questions from Part – B.

PART – A (Marks : 25)

1. Distinguish between microscopic and macroscopic approach of thermodynamics.
2. Explain quasi-static process.
3. Define work in the thermodynamic sense.
4. What is first law of thermodynamics ?
5. Give the statement of Claussius inequality.
6. What is Helmholtz and Gibb's function ?
7. What is meant by triple point of water ?
8. What is anomalous expansion of water ?
9. Draw the diesel cycle on P – V and T-ϕ diagrams.
10. What is Stoichiometric mixture ?

PART – B (Marks : 50)

11. (a) Explain working principle of constant volume gas thermometer. **5**

    (b) A piston-cylinder device with air at an initial pressure of 100 kPa. Volume of 0.1 m^3 undergoes an expansion process to 37.9 kPa and 0.2 m^3. Calculate the work done by the system. **5**

12. A gas undergoes a thermodynamic cycle consisting of the following processes : (i) Process 1 – 2 : Constant pressure P = 1.4 bar, $V_1 = 0.028\ m^3$, $W_{1-2} = 10.5$ kJ, (ii) Process 2 – 3 : compression with PV = constant, $V_3 = V_2$, (iii) Process 3 – 1 : constant volume, $V_1 - V_3 = -26.4$ kJ. There are no significant changes in KE and PE. (a) Sketch the cycle on a P – V diagram (b) Calculate the net work for the cycle in kJ (c) Calculate the heat transfer for process 1- 2 (d) Show that $\sum_{cycle} Q = \sum_{cycle} W$. **10**

13. (a) Derive an expression for change in entropy for a reversible isobaric process. 3

(b) A heat pump is used to maintain temperature in a hall at 50 °C where atmospheric temperature is 30 °C. Heat transfer to the hall is 1600 kJ/min. Calculate the power required to run the actual heat pump if COP of actual heat pump is 30% of Carnot heat pump working between the same temperature limits. 7

14. (a) Derive four Maxwell's relations. 5

(b) Find the enthalpy and entropy of steam when the pressure is 2 MPa and specific volume is 0.09 m^3/kg. 5

15. Steam at a pressure of 8.3 bars and 0.95 dryness is expanded to a pressure of 1.7 bar. Find by using steam tables the final condition of steam and the heat drop for each of the following methods of expansion (i) Adiabatic expansion (ii) Throttling expansion. 10

16. (a) Explain the working of Bomb calorimeter. 6

(b) Give advantages and disadvantages of liquid fuels over solid fuels. 4

17. An engine working on Otto cycle is supplied with air at 0.1 MPa, 35 °C. The compression ratio is 8. Heat supplied is 2100 kJ/kg. Calculate the maximum pressure and maximum temperature of the cycle, the cycle efficiency and mean effective pressure. 10
