Code No: RT21033 **R13** SET - 1

II B. Tech I Semester Supplementary Examinations, May/June - 2017
THERMODYNAMICS
(Com. to ME, AE, AME)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) Distinguish between microscopic and macroscopic approach of thermodynamics. (4M)
b) Distinguish between characteristic gas constant and molar gas constant (3M)
c) Enunciate the two classical statements Kelvin-Planck and Claussius of second law of thermodynamics. (4M)
d) What do you understand by the degree of superheat and degree of sub-cooling? (4M)
e) What is Avagadro`s law? (3M)
f) What do you understand by steam rate and heat rate? What are their units? (4M)

PART -B

2. a) Explain Joules experiment and state the first law of thermodynamics applied to a closed system undergone by a cyclic process. (8M)
b) A mass of gas is compressed in a quasi-static process from 80 kPa, 0.1 m^3 to 0.4 MPa, 0.03 m^3. Assuming that the pressures volume are related by PV^n=constant, find net work done by gas system. (8M)

3. a) Show that the enthalpy of a fluid before throttling is equal to that after throttling. (6M)
b) A room for four persons has two fans, each consuming 0.18 kW power, and three 100W lams. Ventilation air at the rate of 80 kg/h enters with an enthalpy of 84 kJ/kg and leaves with an enthalpy of 59 kJ/kg. If each person puts out heat at the rate of 630 kJ/hr. Determine the rate at which heat is to be removed by a room cooler, so that a steady state is maintained in the room. (10M)

4. a) Show that the entropy change in a cyclic process is zero. (6M)
b) Ten kg of water at 20^0C is converted into ice at -10^0C at constant atmosphere pressure. Assuming the specific heat of liquid water to remain constant at 4.2 kJ/kg K and that of ice to be half of this value and taking the latent heat of fusion of ice at 0^0C to be 335 J/g. calculate the total entropy change of the system. (10M)
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5. a) Discuss the various methods of evaluating the properties of a pure substance when it is in (i) superheated state (ii) wet condition and (iii) sub-cooled condition. (8M)
   b) A pressure cooker contains 2 kg of steam at 6 bar and 0.9 dryness fraction, find the heat must be rejected to make the quality of steam 0.5. (8M)

6. a) Show that for an ideal gas the internal energy depends only on its temperature. (6M)
   b) An air-water vapour mixture enters an adiabatic saturator at 30^0C and leaves at 20^0C, which is the adiabatic saturation temperature. The pressure remains constant at 100k Pa. determine the relative humidity and the humidity ratio of the inlet mixture. (10M)

7. a) Show that the efficiency of the Otto cycle depends only on the compression ratio. (6M)
   b) An air standard dual cycle has a compression ratio of 16, and compression begi0ns at 1 bar, 50^0C. The maximum pressure is 70 bar. The heat transferred to air at constant pressure is equal to that at constant volume. (10M)
   Estimate (i) the pressures and temperatures at the cardinal points of the cycle,
   (ii) the cycle efficiency and
   (iii) the m.e.p. Of the cycle, C_V=0.718 kJ/kg K, C_P=1.005 kJ/kg K.