Code No: 153BZ

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, October - 2020
THERMODYNAMICS
(Mechanical Engineering)

Time: 2 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1. A mass of 8 kg gas is expands in a flexible container so that the p-v relationship is in the form of $pv^{1.2}$=const. the initial pressure is 1000 kPa and the initial volume is 1 m^3. The final pressure is 5 kPa. If the specific internal energy of the gas is decreases by 40 kJ/kg, find the heat transfer in magnitude and direction. [15]

2. A room for four persons has two fans, each consuming 0.18 kW power, and three 100 W lamps. 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/h, determine the rate at which heat is to be removed by a room cooler, so that a steady state is maintained in the room. [15]

3.a) Prove that energy is a property.
b) Apply steady flow energy equation for nozzle, compressor and condenser. [7+8]

4.a) Derive the Maxwell's relations.
b) Sketch the thermodynamic mnemonic diagram and explain its use to obtain Gibbs equations and Maxwell relations. [7+8]

5. A steam pressure of holding capacity 4 m^3 contains a mixture of saturated water and saturated steam at 250 ^{0}C. The mass of the liquid present is 1 ton. Determine (a) Quality; (b) Specific Volume; (c) Specific Enthalpy; (d) Specific Entropy and (e) Specific Internal Energy of steam. [15]

6. Explain in detail about throttling and free expansion processes with a neat sketch and also mention their applications. [15]

7.a) State Avagadro's Hypothesis.
b) State and explain Dalton's law partial pressure and prove the statement mathematically. [7+8]

8. How does the vapour compression refrigeration system work? Explain with suitable diagrams. [15]

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