Code No: R1921035 **R19** SET - 1

II B. Tech I Semester Supplementary Examinations, September - 2021
THERMODYNAMICS
(Com to ME, AME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1 a) Define the following terms: i) Thermodynamics ii) Macroscopic approach iii)Continuum.

b) A gas initially at 100KPa and 6000cm^3. The final volume is 2000cm^3. Determine the moving boundary work for each of the following processes.
(i) P is inversely proportional to V (ii) PV^2= constant iii) P is inversely proportional to V.

Or

2 a) Classify the types of systems; explain with examples.

b) A fluid at a pressure of 3 bar and with specific volume of 0.18 m/kg contained in a cylinder behind a pistonexpands reversibly to a pressure of 0.6 bar according to a law , $p=c/v^3$ where c is a constant .Calculate the work done by the fluid on the piston.

3 a) Define enthalpy. How is it related to internal energy?

b) Calculate the power developed and diameter of the inlet pipe, if a gas enters thegas turbine at 5 kg/sec, 50 m/s with an enthalpy of 0.9MJ/kg. The heat loss to thesurrounding is 0.025 MJ/kg. The heat loss to the surrounding is 0.025 MJ/kg. The heat loss to the surrounding is 0.025 MJ/kg. Assume 100 kPa and 300 K at the inlet.

Or

4 a) Describe the classic paddle wheel experiment performed by Joule. What conclusion was drawn based on the experimental observations (Joule experiment).

b) Calculate the power developed and diameter of the inlet pipe, if a gas enters into thegas turbine at 5 kg/sec, 50 m/s with an enthalpy of 0.9MJ/kg. The heat loss to thesurrounding is 0.025 MJ/kg. The heat loss to the surrounding is 0.025 MJ/kg. Theheat loss to the surrounding is 0.025 MJ/kg. Assume 100 kPa and 300 K at the inlet.

5 a) Explain the Availability in a thermodynamic system with example.

b) A heat engine working on Carnot cycle converts 1/5th of the heatinput into work. When the temperature of the sink is reduced by 80^0C, the efficiency gets doubled. Determine the temperature of sink?

Or

6 a) Define Gibb's and Helmholtz's functions? Compare the importance of them?

b) A domestic food freezer maintains a temperature of -15^0C, theambient air temperature is 30^0C, if heat leaks into the freezer at the continuous rate of 1.75kJ/sec. State the least power necessary topump this heat out continuous?
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7 a) Why can not a throttling calorimeter measure the quality, if the steam is wet? Explain how the quality is been measured?

b) 1 kg of water fills a 150 L rigid container at an initial pressure of 2MPa. The container is then cooled to 40^0C. Determine the initial temperature and final pressure of the water.

Or

8 a) Explain the saturation temperature, the changes in specific volume, enthalpy and entropy during evaporation at 1MPa.

b) A vessel of volume 0.04 m^3contains a mixture of saturated waterand steam at a temperature of 250°C. The mass of the liquidpresent is 9 kg. Find the pressure, mass, specific volume, enthalpy, entropy.

9 a) Explain the Mole fraction and Mass fraction in the Mixture of Perfect gas? Derive a relation between them.

b) Saturated air at 210^0C is passed through a dryer, so that its final relative humidity is 20%. The dryer uses silica gel absorbent. The air is then pass through a cooler until its final temperature is 210^0C without a change in specific humidity. Find out i) the temperatureof air at the end of the drying process, ii) the relative humidity atthe end of the cooling process, iii)The dew point temperature at the end of the drying process?

Or

10 a) Air at 10bar and a DBT of 400°C and WBT of 360°C. Compute degree of saturation, dew point temperature and enthalpy of the mixture?

b) Enumerate different psychometric processes.