I B. Tech II Semester Regular/Supplementary Examinations, AUGUST- 2022
THERMODYNAMICS
(Only ME)

Time: 3 hours   Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks
~~~~~~

UNIT-I

1. a) Define a new thermodynamic scale say degrees N, in which the freezing point and boiling point of water are 100^0N and 300^0N respectively. Correlate this temperature scale with centigrade scale. (7M)

   b) Explain about quasi-static process in detail. (7M)

Or

2. a) Define the following terms: (7M)
   i) Thermodynamics
   ii) Macroscopic approach
   iii) Continuum.

   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. (7M)

UNIT-II

3. a) The properties of a certain fluid are related as follows: (5M)
   $u = 196 + 0.718t$
   $pv = 0.287 (t + 273)$
   Where u is the specific internal energy (kJ/kg), t is in °C, p is pressure (kN/m^2), and v is specific volume (m^3/kg). For this fluid, find cv and cp.

   b) A gas undergoes a thermodynamic cycle consisting of the following processes: (9M)
   (I) Process 1–2: Constant pressure p = 1.4 bar, $V_1 = 0.028$ m^3, $W_{12} = 10.5$ kJ
   (II) Process 2–3: Compression with pV = constant, $U_3 = U_2$
   (III) Process 3–1: Constant volume, $U_1 – U_3 = – 26.4$ kJ.
   There are no significant changes in KE and PE.
   (i) Sketch the cycle on a $p–V$ diagram
   (ii) Calculate the net work for the cycle in kJ
   (iii) Calculate the heat transfer for process 1–2
   (iv) Show that $\sum$Qcycle = $\sum$Wcycle

Or

4. a) Discuss the applicability of S.F.E.E for heat exchanger and throttling device. (7M)

   b) Write the limitations of first law of thermodynamics. Also explain about PMM-I. (7M)

UNIT-III

5. a) Derive an expression for entropy changes for a closed system of polytropic process. (9M)

   b) A copper ball weighing 0.4536 kg and uniformly heated to 310.7 K is dropped in a cold bath where upon it cools down to 267 K. Calculate the entropy change of the ball for the process (5M)

Or

|'"|'|'|''|''|ll'|ll

6 a) Derive Maxwell Equations.   (9M)

  b) Is the Third law of thermodynamics, an extension of second law? Is it an (5M)
      independent law of nature? Explain?

UNIT-IV

7 a) Discuss the importance of T-S and h-s diagram.   (7M)

  b) A rigid close tank of volume $3m^3$ contains 5 kg of wet steam at a pressure of 200 (7M)
      kPa. The tank is heated until the steam becomes dry saturated. Determine final
      pressure and heat transfer to the tank.

Or

8 a) Steam flows in a pipe line at 1.5 Mpa. After expanding to 0.1 Mpa in throttling (9M)
      calorimeter, the temperature is found to be 120^0 C. Find the quality of steam in the
      pipe line. What is the maximum moisture at 1.5 Mpa that can be determined with
      this set-up it at least 5^0 C of super heat is required after throttling for accurate
      readings?

  b) Draw the phase equilibrium diagram for a pure substance on T-s plot with relevant (5M)
      constant property lines.

UNIT-V

9 a) Discuss about Avagadro's Hypothesis.   (7M)

  b) Moist air at 1 atm. pressure has a dry bulb temperature of 32^0C and a wet bulb (7M)
      temperature of 26^0C. Calculate i) the partial pressure of water vapour, ii) humidity
      ratio, iii) relative humidity, iv) dew point temperature, v) density of dry air in the
      mixture, vi) density of water vapour in the mixture and vii) enthalpy of moist air
      using perfect gas law model and psychrometric equations.

Or

10 a) Discuss about compressibility charts.   (7M)

  b) On a particular day the weather forecast states that the dry bulb temperature is (7M)
      37^0C, while the relative humidity is 50% and the barometric pressure is 101.325
      kPa. Find the humidity ratio, dew point temperature and enthalpy of moist air on
      this day.

|'"'|'|'|'|'|''|'||'|||