

CBCS SCHEME

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Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Engineering Thermodynamics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Distinguish between
i) Macroscopic and microscopic properties (08 Marks)
ii) Intensive and extensive properties (04 Marks)
- b. Briefly explain Thermodynamic equilibrium. (04 Marks)
- c. A turbine is supplied with steam at a gauge pressure of 1.4Mpa. After expansion in the turbine the steam flows in to a condenser which is maintained at a vacuum of 710mm Hg. The barometric pressure is 772mm Hg. Express the inlet and exhaust steam pressure in Pascals (absolute). Take the density of Hg as $13.6 \times 10^3 \text{Kg/m}^3$. (08 Marks)

OR

- 2 a. Explain briefly Heat and work with an suitable examples. (12 Marks)
- b. Define Briefly with an suitable sketch
i) Electrical work ii) Shaft work. (08 Marks)

Module-2

- 3 a. Derive Steady State Energy Equation (SFEE). State the assumptions made. (10 Marks)
- b. In a steady flow apparatus 135kJ of work of done by each Kg of fluid. The specific volume of the fluid, pressure and velocity at the inlet are $0.37 \text{m}^3/\text{Kg}$, 600KPa, and 16m/s. The inlet is 32m above the floor ; and the discharge pipe is at floor level. The discharge condition are $0.62 \text{m}^3/\text{Kg}$, 100KPa, and 270m/s. The total heat loss between the inlet and discharge is 9kJ/Kg of fluid. In flowing through the apparatus does the specific internal energy increase or decrease ϕ by how much? (10 Marks)

OR

- 4 a. Briefly explain with an examples of i) PMM I ii) PMM II (06 Marks)
- b. With a note sketch, explain Keivin – Planck and Clasius statement of second law of thermodynamics. (08 Marks)
- c. A cyclic heat engine operates between a source temperature of 800°C and a sink temperature of 30°C . What is the least rate of heat rejection per kW net output of the engine? (06 Marks)

Module-3

- 5 a. What is Entropy? Explain entropy as a quantitative text for irreversibility, explain, briefly. (10 Marks)
- b. What is available and unavailable energy? Explain, briefly. (10 Marks)

OR

- 6 a. Define the following :
i) Triple point and critical point
ii) Sub-cooled liquid and saturated liquid
iii) Saturated vapour and super heated vapour states of pure substance (12 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- b. A vessel of volume 0.04m^3 contains a minute of saturated water and saturated steam at a temperature of 250°C . The mass of the liquid present is 9Kg . Find the pressure the mass, the specific volume, the enthalpy the entropy and the internal energy. (08 Marks)

Module-4

- 7 a. Briefly explain with a neat sketch vapour compression of a refrigeration system. (10 Marks)
 b. Briefly explain with a neat sketch vapour absorption refrigeration system. (10 Marks)

OR

- 8 a. Write a short note on :
 i) Dry bulb temperature
 ii) Wet bulb temperature
 iii) Dew point temperature
 iv) Specific and relative humidifier (08 Marks)
- b. An air-water vapour mixture enters an adiabatic saturator at 30°C and leaves at 20°C , which is the adiabatic saturation temperature. The pressure remains constant at 100KPa . Determine the relative humidity and the humidity ratio of the inlet mixture. (12 Marks)

Module-5

- 9 a. Explain, briefly operation of a single stage reciprocally compressor. (10 Marks)
 b. What is multi-stage compressor? Explain briefly multi-stage compressor. (10 Marks)

OR

- 10 a. What is the function of Gas turbine? Explain briefly analysis of open and closed cycle gas turbine cycle. (10 Marks)
 b. Explain, briefly
 i) Jet – propulsion
 ii) Rocket propulsion (10 Marks)
