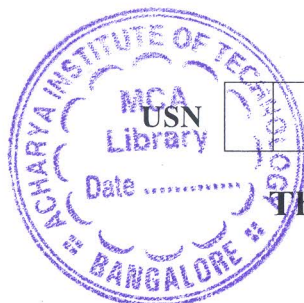


# CBCS SCHEME



18AU32

## 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 stream 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 stream 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  $\phi$  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  $800^\circ\text{C}$  and a sink temperature of  $30^\circ\text{C}$ . 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)

- b. A vessel of volume  $0.04\text{m}^3$  contains a minute of saturated water and saturated steam at a temperature of  $250^\circ\text{C}$ . The mass of the liquid present is  $9\text{Kg}$ . 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  $30^\circ\text{C}$  and leaves at  $20^\circ\text{C}$ , which is the adiabatic saturation temperature. The pressure remains constant at  $100\text{KPa}$ . 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)

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