

Exam.Code:0939
Sub. Code: 6701

2123
B.E. (Mechanical Engineering)
Third Semester
MEC-301: Thermodynamics

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. Use of property, Steam and gas tables is permitted.

x-x-x

Q-1)

- 1) What are adiabatic and diathermic walls?
- 2) What is displacement work?
- 3) Show that energy is property of a system.
- 4) Why do isobars on Mollier diagram, diverge from one another?
- 5) What is a binary vapour cycle?

(5x2=10)

PART A

Q-2)

- 1) Air undergoes two process: 1-2 expansion from $P_1=300\text{kPa}$, $v_1=0.019\text{m}^3/\text{kg}$ to $P_2=150\text{kPa}$ during which the PV relation is given by $PV=\text{constant}$. Process 2-3 is constant pressure compression to $v_3=v_1$. Sketch PV diagram and determine work done per unit mass
- 2) Compare Bernoulli's equation with SFEE.

(5,5)

Q-3)

- 1) The flow energy of $0.124\text{m}^3/\text{min}$ of a fluid crossing a boundary to a system is 18kW . Find pressure at this point.
- 2) A blower handles 1kg/s of air at 20°C and consumes power of 15kW . Inlet and outlet velocities of air are 100m/s and 150m/s respectively. Find exit air temperature, assuming adiabatic conditions.

(5,5)

Q-4)

- 1) 1.5kg of liquid having constant specific heat of 2.5kJ/kg K is stirred in a well insulated chamber causing the temperature to rise by 15°C . Find change in energy and work done for the process.

Contd.....P/2

(2)

- 2) Draw phase diagrams for a pure substance on T-s plot with relevant constant property lines.

PART B

(5,5)

Q-5)

- 1) Derive the relationship between COP of pump with COP of refrigerator
- 2) Show that dissipation of stirring work to internal energy is irreversible.

(5,5)

Q-6)

- 1) Explain how the quality at turbine exhaust gets restricted.
- 2) A steam turbine with an internal efficiency of 90% receives steam at 7MPa and 550°C and exhausts at 20kPaA. Determine turbine work and exit quality of steam.

(5,5)

Q-7)

Write short notes on any 2 of the following:-

- 1) Flow work and Non-flow work
- 2) Throttling device as a steady flow process
- 3) Heat Transfer as a path function

(5,5)

x-x-x