Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
MID TERM EXAMINATION - NOV 2023

Semester : Semester III - 2022
Course Code : MEC4001
Course Name : Sem III - MEC4001 - Basic Thermodynamics
Program : B. TECH

Date : 3-NOV-2023
Time : 11:30AM - 1:00PM
Max Marks : 50
Weightage : 25%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS **(5 X 2 = 10M)**

1. Define Isochoric Process.

(CO1) [Knowledge]

2. Steam at an initial enthalpy of 100 kJ/kg and initial velocity of 100m/s, enters a insulated horizontal nozzle. It leaves nozzle at 200 m/s. Find exit enthalpy from nozzle.
Assume W=0:

(CO1) [Knowledge]

3. Durring one cycle the working fluid in an engine engages in two work interaction: 15 KJ to the fluid and 44 KJ from the fluid and three heat interaction, two of which are known: 75 KJ to the fluid and 40 kJ from the fluid. Evalute the magnitude and direction of third heat transfer.

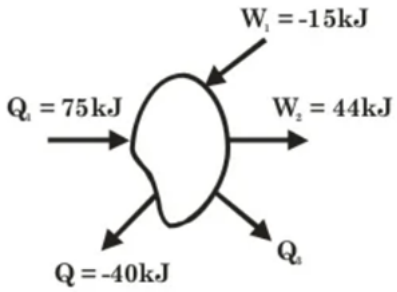

fig.

(CO1) [Knowledge]

4. Explain Zeroth Law of Thermodynamics. What is the outcome of Zeroth Law Law.

(CO2) [Knowledge]

5. Define Open System,Closed System and Isolated System.

(CO2) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS **(2 X 10 = 20M)**

6. A mass of gas is compressed in a quasi-static process from 80 kPa, 0.1 m^3 to 0.4 MPa, 0.03 m^3 . Assuming that the pressure and volume are related by PV^n=Constant, find the work done by the gas system

(CO1) [Comprehension]

7. Amswer the following questions.
a) System b)Surrounding c) Reversible Process d) Pure Substance

(CO2) [Comprehension]

PART C

ANSWER THE FOLLOWING QUESTION **(1 X 20 = 20M)**

8. Air at a temperature of 15°C passes through a heat exchanger at a velocity of 30 m/s where its temperature is raised to 800°C. It then enters a adiabatic turbine with the same velocity of 30 m/s and expands until the temperature falls to 650°C. On leaving the turbine, the air is taken at a velocity of 60 m/s to a adiabatic nozzle where it expands until the temperature has fallen to 500°C. If the air flow rate is 5 kg/s.
Draw diagram for all the three devices and answer these questions:
a) Find the rate of heat transfer in the heat exchanger in Kilowatt.
b) Find Power Output from turbine in Kilowatt.
c) Find the velocity at the exit from nozzle.
Take enthalpy of air as h=CpT, where Cp is the specific heat equal to 1.005 kJ/kg.K and T is the temperature.

(CO2) [Application]