A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 93703

B.E./B.Tech. DEGREE EXAMINATION, NOV 2022

Third Semester

Mechanical Engineering

19UME303– ENGINEERING THERMODYNAMICS

(Regulation 2019)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Mass Transfer cannot takes place in CO1- U

   (a) open system (b) closed system (c) Isolated system (d) None of the above

2. Which one is application of SFEE? CO1- U

   (a) IC Engines (b) Evaporator (c) Condenser (d) Both b & c

3. The efficiency of carnot cycle depends upon CO2- U

   (a) temperature limits (b) pressure ratio

   (c) volume compression ratio (d) cut-off ratio and compression ratio

4. What is the relation between COP of heat pump and refrigerator CO4- U

   (a) COP of pump = COP of refrigerator-1 (b) COP of pump = COP of refrigerator+1

   (c) COP of pump = COP of refrigerator-2 (d) COP of pump = COP of refrigerator+2

5. Pure substance example is CO1- U

   (a) H2 (b) Table Salt (c) Gold (d) All the above

6. What is the actual turbine inlet temperature in Rankine cycle? CO4- U

   (a) 700^0C (b) 800^0C (c) 550^0C (d) 1150^0C

7. Which of the following relation is correct? CO5- U

   (a) dU=TdS-pdV (b) dH=TdS+Vdp

   (c) dG=Vdp-SdT (d) all of the above

8. Maxwell's equations consists of ____ equations. CO5- U

(a) four (b) three (c) two (d) one

9. In sensible heating or cooling CO1- U

(a) work done remains constant (b) dry bulb temperature or air remains constant

(c) both of the mentioned (d) none of the above

10 The wet bulb temperature is the ____ temperature recorded by moistened bulb. CO1- U

(a) lowest (b) highest

(c) atmospheric (d) none of the mentioned

PART – B (5 x 2= 10 Marks)

11 State First Law of Thermodynamics for closed system. CO3- U

12 State Kelvin Planck's second law of thermodynamic. CO4- U

13 What do you understand by pure substance? Give Examples CO1- U

14 What is Clausius Clapeyron equation? CO5- U

15 Define Relative Humidity CO6- U

PART – C (5 x 16= 80 Marks)

16 (a) In a vessel 10 kg of oxygen is heated in a reversible non flow constant volume process , so that pressure of oxygen is increased two times of initial pressure. The initial temperature is 200 C .Calculate the final temperature, Change in internal Energy, Change in Enthalphy, Heat Transfer and final temperature. Take R=0.259 KJ/KgK, C_V=0.625 KJ/KgK CO3-App (16)

Or

(b) A Nozzle is a device for increasing velocity of a steadily flowing steam,at inlet to certain nozzle the enthalpy of fluid is 3000KJ/Kg and the velocity is 60 m/s at discharge end enthalpy is 2762 KJ/Kg.The nozzle is horizontal and there is negligible heat loss from it. (i) Find the velocity at exist from nozzle (ii) If inlet area is 0.1 m^2 and specific volume at inlet is 0.187 m^3 /Kg. Find the mass flow rate iii) If the specific volume at exit is 0.498 m^3/Kg. Find the exit area at nozzle CO3-Ana (16)

17	(a)	A Heat engine supply 19 KW of heat from 565K substance and reject heat to 282.5K to reservoir . which of the following engine is reversible, irreversible and impossible Engine CASE 1- If 14.0833KW of heat is rejected CASE 2- If 4.75 KW of heat is rejected CASE 3- If 9.5 KW of heat is rejected , By using carnot and Clausius inequality method	CO4-Ana	(16)
		Or		
	(b)	A Reversible Heat Engine operates between two reservoirs at temperature of 600^0 C and 40^0 C .The engine drives a reversible refrigerator which operates between reservoir at a temperature of 40^0 C and - 20^0 C. The heat to the heat engine is 2000 KJ and the net work output of the combined engine and refrigerator plant is 360 KJ. Evaluate the heat transfer to the refrigerator and net heat transfer to the reservoir at 40^0 C	CO4-App	(16)
18	(a)	Discuss the different phase change zones of T-S Diagram for water when the temperature rises from solid phase to superheated phase.	CO1-U	(16)
		Or		
	(b)	A Vessel of volume 0.04 m^3 contains a mixture of saturated water and saturated steam at a temperature of 250^0 C. The mass of liquid present is 9 Kg. Find the Pressure, Mass, Specific Volume, Specific Entropy , Specific Enthalpy and Specific Internal Energy	CO1-App	(16)
19.	(a)	Derive Tds equation when (i) T and V independent (ii) T and P independent.	CO5-U	(16)
		Or		
	(b)	Explain the Joule Thomson coefficient with the help of T-p diagram and derive the expression for joule Thomson coefficient. Show that the value of this coefficient for an ideal gas is zero	CO5-U	(16)
20.	(a)	An air conditioning system has the following conditions 1)outdoor conditions 15^0C dry bulb temperature and 10^0C wet bulb temperature 2)required conditions 20^0C DBTand 50% relative humidity, amount of pre air circulated 0.25 m^3/min per person 3) seating capacity 50 person to requied conditons is achieved first by heating and then by adaibatic humidification . determine the following 1) capacity of heating coil 2)capacity of humidifier	CO6-App	(16)
		Or		

(b) An air conditioning system has the following conditions 1)outdoor conditions 32^0C dry bulb temperature and 75% relative humidity 2)required indoor conditions 25^0C DBTand 70% relative humidity, amount of pre air circulated 200 m^3/min per person 3) seating capacity 50 person to requied conditons is achieved first by cooling and dehumidification and then heating Determine the following 1) capacity of cooling coil in tonnes 2)capacity of heating coil iii) Mass of water vapour removed if coildewtemp14^0C CO6-App (16)