Code No: P18AET02

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HALL TICKET NUMBER

PACE INSTITUTE OF TECHNOLOGY & SCIENCES::ONGOLE
(AUTONOMOUS)
II B.TECH I SEMESTER END SUPPLEMENTARY EXAMINATIONS, JAN - 2023
THERMODYNAMICS
(AME Branch)

Time: 3 hours Max. Marks: 60

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answer all the questions in Part-A (5X2=10M)

Q.No.		Questions	Marks	CO	KL
1	a)	Explain the concept of macroscopic and microscopic viewpoints applied to the study of thermodynamics.	[2M]	1	
	b)	Define (a) dryness fraction, and (b) degree of superheat.	[2M]	2	
	c)	State the Second Law of Thermodynamics & prove $(COP)_{HP} = (COP)_{Ref} + 1$	[2M]	3	
	d)	Why Carnot cycle is not practical for a steam power plant?	[2M]	4	
	e)	Write briefly about the Dalton's Law of partial pressures.	[2M]	5	

PART-B

Answer One Question from each UNIT (5X10=50M)

Q.No.		Questions	Marks	CO	KL
		UNIT-I			
2.	a)	During a certain process, the specific heat capacity of a system is given by C = (0.4 + 0.004 T) k.J/kg°C. Find the heat transferred and mean specific heat of gas, when the temperature changes from 25°C to 125°C. The mass of the system is 5 kg.	[5M]	1	
	b)	Write about concept of continuum and explain its importance.	[5M]	1	
		OR			
3.	a)	In a piston-cylinder arrangement, the pressure is inversely proportional to the square of the volume. The initial pressure is 10 bar in the cylinder and the initial volume is 0.1 m3. The volume is now changed so that the final pressure is 2 bar. Find the work done in kJ.	[5M]	1	
	b)	Explain about the various mechanisms of energy transfer.	[5M]	1	
		UNIT-II			
4.		Explain p-V, T-v, T-s, diagrams and p -v-T surface of pure substance.	[10M]	2	
		OR			
5.		Identify the type of steam in the following three cases using steam tables and giving necessary calculations to support your claim. (a) 2 kg of steam at 8 bar with an enthalpy of 5538.0 kJ at a temperature of 170.4°C (b) 1 kg of steam at 2550 kPa occupies a volume of 0.2742 m^3. Also, find the steam temperature. (c) 1 kg of steam at 60 bar with an enthalpy of 2470.73 kJ.	[10M]	2	
		UNIT-III			
6.	a)	State the Carnot theorems and prove it.	[5M]	3	
	b)	Write a shot note on Clausius inequality and concept of entropy.	[5M]	3	
		OR			

7.		300 kg of fish at 5°C is to be frozen at -2°C. The specific heat of fish above freezing point is 4.182 kJ/kg· K and the latent heat of fusion is 234.5 kJ/ kg. Freezing point is -2°C. A refrigerator is used for this purpose which rejects heat in the ambient at 40°C. The COP of the refrigerator is 60% of the COP of a Carnot refrigerator operating between the same temperature limits. How much power must be required to remove the heat in 10 hours?	[10M]	3	
		UNIT-IV			
8.		Explain the effects of operating variables on the Rankine cycle with the help of p-V and T-s diagrams wherever necessary.	[10M]	4	
		OR			
9.		In a steam power plant operating on an ideal Rankine cycle, the steam enters the turbine at 3 MPa and 400°C and it is exhausted at 10 kPa. Determine (a) Thermal efficiency, (b) Thermal efficiency if the steam is superheated to 500°C at 3 MPa, before it enters the turbine	[6M]	4	
		UNIT-V			
10.	a)	State the Dalton's and Amagat's Law and discuss their importance.	[5M]	5	
	b)	Write about compressibility factor and its significance in thermodynamics.	[5M]	5	
		OR			
11.		A vessel of volume 0.4 m^3 contains 0.45 kg of carbon monoxide and 1 kg air, at 15°C. Calculate the partial pressure of each constituent and the total pressure in the vessel. The air contains 23.3% oxygen and 76. 7% nitrogen by mass. Take the molar masses of carbon monoxide, oxygen and nitrogen as 28, 32 and 28 kg/k mol, respectively.	[10M]	5	

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