Code No: P18MET01

R18

HALL TICKET NUMBER

PACE INSTITUTE OF TECHNOLOGY & SCIENCES::ONGOLE
(AUTONOMOUS)
II B.TECH I SEMESTER END SUPPLEMENTARY EXAMINATIONS, MARCH/APRIL - 2023
THERMODYNAMICS
(ME 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)	Define Specific Heat at Constant Pressure and Constant Volume.	[2M]	1	
	b)	Write Kelvin-Plank And Clausius Statements.	[2M]	2	
	c)	What do you understand by triple point?	[2M]	3	
	d)	Atmospheric air at 20°C DBT and 15°C WBT is undergoing an adiabatic saturation process, show the process on psychometric chart.	[2M]	4	
	e)	What do you mean by Cluster?	[2M]	5	

PART-B

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

Q.No.		Questions	Marks	CO	KL
		UNIT-I			
2.		A system composed at 2 kg of the above fluid expands in a frictionless piston and cylinder machine from an initial state of 1 MPa, 100oC to a final temperature of 30^0C. If there is no heat transfer, find the network for the process.	[10M]	1	
		OR			
3.	a)	A piston-cylinder device operates 1 kg of fluid at 20 atm. Pressure. The initial volume is 0.04 m3/s. The fluid is allowed to expand reversibly following a process $PV^{1.4}$ = constant so that the volume becomes double. The fluid is then cooled at a constant pressure until the piston comes back to the original position. Keeping the piston unaltered, heat is added reversibly to restore it to the initial pressure. Calculate the work done in the cycle.	[5M]	1	
	b)	Explain in detail the working of constant volume gas thermometer.	[5M]	1	
		UNIT-II			
4.		Air Flows through an Adiabatic Compressor At 2kg/S. The Inlet Conditions Are 1 Bar And 310 K And The Exit Conditions Are 1bar And 560k.The Ambient Temperature Can Be Taken As 298k, the Specific Heat At Constant Pressure For Air Is 1.005kj/Kg-K And The Gas Constant For Air Is 0.287Kj/Kg-K.	[10M]	2	
		OR			
5.		A reversible heat engine operates between two reservoirs at temperatures of 600oC and 40oC. The engine drives a reversible refrigerator which operators between reservoirs at temperatures 40oC and -20oC. The heat transfer to the heat engine is 2000kJ and the network output of the combined engine refrigerator plant is 360 kJ. Evaluate the heat transfer to the refrigerator and the net heat transfer to the reservoir at 40oC.	[10M]	2	
		UNIT-III			

6.		State Kelvin-Plank and Clausius statements of Second law of Thermodynamics and prove their equivalence.	[10M]	3	
		OR			
7.		In a separating and throttling calorimeter the pressure of the steam before throttling is 10bar. The pressure and temperature of steam after throttling is 1.1 bar and 110^0C respectively. At the separator 0.6 kgs of water is trapped and 3.4 kgs of condensed water is collected from the condenser. Determine the dryness fraction of steam in the main pipeline. Take Cp for superheated steam 2.1 kJ/kg k	[10M]	3	
		UNIT-IV			
8.	a)	Explain the terms Mole fraction and Volume fraction.	[5M]	4	
	b)	Air at 200C, 40% RH is mixed adiabatically with air at 40^0C, 40% RH in the ratio of 1 kg of former with 2 kg of the latter (on dry basis). Find the final condition of air.	[5M]	4	
		OR			
9.		What is quality of steam? What are the different methods of measurement of quality? Explain them with neat sketches.	[10M]	4	
		UNIT-V			
10.		Derive an expression for thermal efficiency of Otto cycle.	[10M]	5	
		OR			
11.		The compression ratio of an air-standard Otto cycle is 9.5. Prior to the isentropic compression process, the air is at 100 kPa, 35°C, and 600 cm3. The temperature at the end of the isentropic expansion process is 800 K. Using specific heat values at room temperature; determine (*a*) the highest temperature and pressure in the cycle; (*b*) the amount of heat transferred in, in kJ; (*c*) the thermal efficiency; and (*d*) the mean effective pressure.	[10M]	5	

******