Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

UG/PG DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL/MAY 2026

Fourth Semester

Chemical Engineering

UCHT24403 / CH3401 – CHEMICAL ENGINEERING THERMODYNAMICS – I

(Use of approved Thermodynamics Tables, Mollier diagram and Steam table Can be Permitted)

Regulations – 2024 & 2021

Duration : 3 Hrs *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Compare path functions and point functions.	L2	1	2
2.	Explain Zeroth law of thermodynamics.	L2	1	2
3.	Outline the sign conversion for work and heat.	L2	2	2
4.	List the limitations of first law of thermodynamics.	L1	2	2
5.	Sketch the p-V and T-s diagram for Carnot cycle.	L2	3	2
6.	Define entropy.	L1	3	2
7.	What are derived properties? Name them.	L1	4	2
8.	List the fields of application of different types of thermodynamic diagram.	L1	4	2
9.	What do you understand from the “throttling process”?	L1	5	2
10.	Name the important classifications in expansion processes.	L2	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a	i	How would you compare reversible and irreversible processes?	L2	1	6
		ii	Summarize the mode of work transfer.	L2	1	10
			Or			
	b	i	How would you compare open and close system with example?	L2	1	6
		ii	Explain how ideal gas temperature scale is devised.	L2	1	10
12.	a		Develop & Explain the PVT behavior of fluids in detail with a neat sketch.	L3	2	16
			Or			
	b		A piston and cylinder machine contains a fluid system which passes through a complete cycle of four processes. During the cycle, the sum of all heat transfers is -170 kJ. The system completes 100 cycles per minute. Solve & Complete the following table showing the method for each item and compute the net rate of work output in kW.	L3	2	16

Process	Q (kJ/min)	W (kJ/min)	ΔE (kJ/min)
a-b	0	2,170	-
b-c	21,100	0	-
c-d	-2,100	-	-36,600
d-a	-	-	-

13.	a	A reversible heat engine operating between reservoirs at 900K and 300K drives a reversible refrigerator operating between reservoirs at 300K and 250K. The heat engine receives 1800kJ heat from 900K reservoir. The net output from the combined engine refrigerator is 360kJ. Determine the heat transferred to the refrigerator and the net heat rejected to the reservoir at 300K.	L5	3	16
		Or			
	b	Air at a temperature of 15°C passes through a heat exchanger at a velocity of 30m/s where its temperature is raised to 800°C. It then enters a 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 60m/s to a nozzle where it expands until the temperature has fallen to 500°C. If the air flow rate is 2 kg/s, Determine: (i) The rate of heat transfer to the air in the heat exchanger, (ii) The power output from the turbine assuming no heat loss, and (iii) The velocity at exit from the nozzle, assuming no heat loss. Take the enthalpy of air as h = Cp T, where Cp is the specific heat equals to 1.005 kJ/kgK and 'T the temperature.	L5	3	16
14.	a	Derive the Maxwell relations and Explain their importance in thermodynamics.	L3	4	16
		Or			
	b	Derive the residual property relations for Gibbs free energy & Helmholtz free energy and entropy.	L3	4	16
15.	a	Draw a general layout of steam power plant with neat sketch.	L4	5	16
		Or			
	b	Explain the thermodynamics aspects of compression process and its classifications.	L4	5	16