Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Fourth Semester

Chemical Engineering

CH3491 – Heat Transfer

Steam table can be permitted

Regulations - 2021

Duration : 3 Hrs ***Maximum : 100 Marks***

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

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Write the modes of heat transfer with example.	L1	1	2
2.	What is mean by transient heat conduction?	L2	1	2
3.	Write the physical significance of Prandtl number.	L1	2	2
4.	Explain the mode of heat transfer takes place in a thermoflask.	L1	2	2
5.	Classify the types of heat exchanger based on the nature of heat exchange process.	L2	3	2
6.	Write any two applications of shell and tube heat exchanger.	L1	3	2
7.	Why is higher heat transfer rates experience in drop wise condensation than in film wise condensation?	L1	4	2
8.	Identify the effect of non-condensable gases on rate of condensation?	L2	4	2
9.	List out the feeding arrangements in multiple effect evaporator.	L2	5	2
10.	Define black body and grey body.	L2	5	2

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

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a		A flat furnace wall is constructed of a 10 cm layer of refractory brick with thermal conductivity 0.12 Kcal/hr.m.°C, backed by a 20 cm layer of common brick with thermal conductivity 1.2 Kcal/hr.m.°C. The temperature of the inner face of the wall is 760°C and that of all the outer face 75°C. Calculate the heat loss through this wall per unit area and the temperature of the interface between the refractory brick and common brick.	L4	1	16
			Or			
	b	i	Derive a one-dimensional steady state heat conduction equation for composite cylinder having radius r_1, r_2, r_3 and r_4 using uniform thermal conductivity.	L4	1	8
		i	Sketch the thermal resistance for composite cylinder having thermal	L4	1	8

		i	conductivity K_A, K_B, and K_C.			
12.	a		Show by dimensional analysis that for the case of forced convection heat transfer, Nusselt number is a function of Reynolds number and Prandtl number.	L3	2	16
			Or			
	b		Air at 300K and 101.325 kPa flows over a flat plate at a velocity of 2 m/s. The plate is heated over its entire length to a temperature of 333K. Calculate the heat transferred in the first 20 cm of the plate. The plate is 1 m wide. Data: v for air= 17.36 x 10^{-6} m/s k for air= 0.0275 W/mK C_p for air= 1.006 KJ/kgK N_{pr} for air= 0.7	L3	2	16
13.	a		Explain the construction and working principle of double pipe heat exchanger with neat diagram.	L3	3	16
			Or			
	b		Water enters a double pipe heat exchanger at 15°C, flowing at a rate of (1 1300 kg/h. It is heated by oil flowing at a rate of 550 kg/h from a inlet temperature of 94°C. Determine the total heat transfer, outlet temperature of oil and water and effectiveness for i) Parallel flow ii) Counter flow iii) Data: Cp of oil = 2000 J/kg.K Cp of water = 4187J/kg.K U=1075 W/m² K A=1m²	L3	3	16
14.	a	i	Distinguish between drop wise and film wise condensation.	L2	4	7
		i i	Vertical flat plate in the form of fin is 600m in height and is exposed to steam at atmospheric pressure. If surfaces of the plate is maintained at 60°C calculate the following: the film thickness at the trailing edge of the film and the overall heat transfer coefficient.	L2	4	9
			Or			
	b		Define terms nucleate boiling and film boiling. Explain the various stages involved in the boiling of saturated liquid.	L2	4	16
15.	a		Compare feed forward and feed backward evaporator.	L2	5	16
			Or			
	b		Derive the exchange of energy between two parallel planes of different emissivity for radiant heat exchange between infinite parallel surfaces.	L2	5	16