Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

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

Seventh Semester

CHEMICAL ENGINEERING

CH3702 – TRANSPORT PHENOMENA

Regulations - 2021

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

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

Q.No	Questions	BTL	CO	Marks
1.	Define viscosity	L1	1	2
2.	How does shear stress vary across thickness of a falling film?	L2	1	2
3.	Define thermal conductivity	L1	2	2
4.	Define energy flux	L1	2	2
5.	What is diffusivity?	L1	3	2
6.	Define mass flux	L1	3	2
7.	Tell the equation of energy balance	L2	4	2
8.	Define laminar flow and turbulent flow	L1	4	2
9.	List the assumptions for shell momentum balance	L2	5	2
10.	What is meant by thermal boundary layer?	L1	5	2

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

Q.No			Questions	BTL	CO	Marks
11.	a	i	Derive the velocity profile for flow through a falling film and expression to determine film thickness	L3	1	10
		ii	Justify how the viscosity of liquids and low density gases depends on the temperature and pressure?	L3	1	6
			or			
	b	i	Oil has a kinematic viscosity of $2x10^{-4}$ m^2/sec and a density of $0.8x10^3$ kg/m^3. If we want to have a falling film thickness of 2.5 mm on a vertical wall, estimate the mass flow rate of flow of the liquid.	L3	1	7
		ii	A horizontal annulus 27 ft in length has an inner radius of 0.495 inch and an outer radius of 1.1 inch. A 60% aqueous solution of sucrose ($C_{12}H_{22}O_{11}$) is to be pumped through a annulus at 20 °C, at this temperature the solution density is 80.3 lb/ft^3 and the viscosity is 136.8 lb.m/ft.s, estimate the volume flow rate where the impressed pressure difference is 5.39 psi.	L3	1	9
12.	a		Derive an expression for temperature distribution in a cooling film	L3	2	16
			or			
	b	i	Derive the temperature profile for heat conduction with nuclear heat source	L3	2	9
		ii	Derive an expression for conduction in composite wall	L3	2	7
13.	a	i	Estimate the D_{AB} for the system argon-oxygen at 293.2 K and 1 atm. total pressure The properties of species are	L3	3	8

Compound	M	T_c	P_c
A (argon)	39.04	151.2	48.0
B (oxygen)	32.00	154.4	49.7

		ii	Elaborate the relation between boundary diffusivity and viscosity for gases and	L2	3	8

			liquids			
			or			
	b	i	Develop an expression for diffusivity through a stagnant gas film.	L3	3	8
		ii	Elaborate the difference between homogeneous and heterogeneous reaction.	L2	3	8
14.	a		Develop an expression for the equation of motion for pure fluids	L3	4	16
			or			
	b	i	Develop an equation for the dimensional analysis of the equation of change	L3	4	8
		ii	Organize the equation of energy for a multicomponent system and discuss its significance	L3	4	8
15.	a		Discuss the temperature fluctuation and the time smoothed temperature in turbulent flow.	L3	5	16
			or			
	b	i	Elaborate the analogous nature of mass, momentum and energy transport.	L3	5	9
		ii	Discuss the relationship between thermal boundary layer and hydrodynamic boundary layer	L3	5	7