QP Code: RM23MTECH083 | Reg. No | | | | | | | | | | | AY 23

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech (Second Semester) Examinations, May – 2024

MPCCH2051– Advanced Transport Phenomena

(Chemical)

Time: 3Hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer all questions	CO#	Blooms Level
a. Define velocity distribution equation.	CO1	K1
b. Write the macroscopic mass balance equation.	CO1	K2
c. Write the macroscopic momentum balance equation.	CO2	K2
d. What are the characteristic dimensionless groups that arise in the correlations for Nusselt numbers for free convection?	CO3	K1
e. Give examples of packed bed equipment where heat transfer coefficient is important.	CO3	K1
f. Write the unit and dimension of kinematic viscosity.	CO2	K2
g. Define Viscosity and Viscometer.	CO2	K2
h. State the mathematical expression for rhiophobic fluid.	CO1	K2
i. Thermal conductivity varies with temperature linearly. At T=T0, K= K0 and at T=T1, K=K1. Write the equation relating K and T.	CO2	K1
j. Define Nusselt number and Prandtle number.	CO4	K1

PART – B **(10 x 5=50 Marks)**

Answer ***ANY FIVE*** questions	Marks	CO#	Blooms Level
2. Derive an expression for velocity profile in a circular pipe of radius R and length L, when a Newtonian fluid is flowing inside the pipe vertically downward.	10	CO1	K2
3. Derives an expression for shear stress profile of a falling film vertically downward, for a Newtonian fluid.	10	CO1	K2
4. Convert the differential equation into dimensionless form $$D_{AB}\frac{d^2C_A}{dz^2}=\frac{dC_A}{dt}$$	10	CO2	K3
5. A heated sphere of radius R suspended in a large motionless body of fluid, Show that, $Nu=\frac{hD}{K}=2$. Where h is heat transfer coefficient, D is the diameter of sphere and K is the thermal conductivity.	10	CO2	K3
6. What pressure gradient is required to cause diethylaniline, C6H5N(C2H5)2, to flow in a horizontal, smooth, circular tube of inside diameter D = 3 cm at a mass rate of 1028 g/s at 0°C? At this temperature the density of diethylaniline is ρ= 0.935 g/cm3 and its viscosity is 1.95 cP.	10	CO3	K3
7. Derive an expression for velocity profile of Newtonian fluid flow between two vertical walls, separated by a distance 2B. Taking origin at midpoint of 2B distance.	10	CO4	K4
8. Explain Prandtl mixing length concept in turbulent flow.	10	CO4	K3

--- End of Paper ---