

Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-VIII EXAMINATION – WINTER 2025

Subject Code:2180507

Date:18-11-2025

Subject Name:Transport Phenomena

Time:02:30 PM TO 05:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		Marks
Q.1	(a) Define viscosity?	03
	(b) Discuss different time derivatives.	04
	(c) Discuss the conservation laws governing the transport phenomena.	07
Q.2	(a) Write physical significance of Reynolds number.	03
	(b) Discuss the significance of thermal conductivity.	04
	(c) Derive the Navier-Stoke's equation.	07
	OR	
Q.2	(c) Derive the equation of continuity	07
Q.3	(a) Write the general shell energy balance equation.	03
	(b) Compare the molecular and convective energy flux.	04
	(c) Derive the velocity profile for laminar flow of a Newtonian incompressible fluid through a circular cross section pipe.	07
	OR	
Q.3	(a) Define thermal diffusivity.	03
	(b) Discuss different theories used to find conductivity of a gas.	04
	(c) Derive the velocity profile and mass flow rate for laminar flow of a Newtonian incompressible fluid through a narrow slit between a two parallel plates.	07
Q.4	(a) Write the components of the molecular momentum flux tensor.	03
	(b) Shortly explain the theory of diffusion in gases at low density.	04
	(c) Derive the temperature profile for heat conduction by chemical reaction as heat source.	07
	OR	
Q.4	(a) What is the condition for potential flow?	03
	(b) Explain temperature and pressure dependency of diffusivity.	04
	(c) Derive the temperature distribution for heat conduction by nuclear heat source.	07
Q.5	(a) Define Mass and Molar average velocity.	03
	(b) With suitable examples discuss the difference between free and forced convection heat transport phenomena.	04
	(c) Derive relation for molar flux of diffusion of A through stagnant non-diffusing B.	07
	OR	
Q.5	(a) Define and mass and molar concentrations.	03
	(b) Explain equimolar counter diffusion.	04
	(c) Derive equation of continuity for multicomponent mixtures.	07
