

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2023****Subject Code:3142110****Date:19-01-2024****Subject Name: Introduction to Transport Phenomena****Time: 10:30 AM TO 01:00 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) How transport phenomena is different than Material thermodynamics?	03
	(b) Explain Kinematic viscosity, specific weight, specific gravity and pressure	04
	(c) Define fluid and classify fluid based on newton's law of viscosity.	07
Q.2	(a) Define followings: (1) Viscosity (2) Specific Volume (3) Surface Tension	03
	(b) Differentiate free convection and force convection	04
	(c) Explain different type's fluid flows.	07
	OR	
	(c) Derive differential momentum balance equation.	07
Q.3	(a) Explain Newton's law cooling.	03
	(b) Determine mass density and specific weight of liquid having specific gravity 1.	04
	(c) Explain how radiation is differ than conduction and convection.	07
	OR	
Q.3	(a) A surface at 250°C exposed to surrounding at 110°C convects and radiates heat to the surroundings. The convection coefficient and radiation factor are 75 W/m ² °C and unity respectively. If the heat is conducted to the surface through a solid of conductivity 10 W/m°C, what is the temperature gradient at surface in the solid?	03
	(b) Derive the unit of thermal conductivity with help of Fourier law of heat conduction.	04
	(c) Derive differential equation of heat conduction in rectangular coordinate system.	07
Q.4	(a) Explain concept of black body	03
	(b) A plane wall is 150 mm thick and its wall area is 4.5 m ² . If its conductivity is 9.35 W/m°C and surface temperatures are steady at 150°C and 50°C. Determine (i) Heat flow across the plane wall. (ii) Temperature gradient in the flow direction.	04
	(c) Derive equation of viscosity measurement by Stoke' method.	07
	OR	
Q.4	(a) Discuss Kirkindal effect.	03
	(b) Explain Fick's first law of diffusion & what its limitations are?	04
	(c) State Euler's equation of motion. And derive Bernoulli's equation.	07
Q.5	(a) Explain term Mass Density and Mass fraction.	03
	(b) Explain pseudo steady diffusion.	04
	(c) Derive the general mass transfer equation in Cartesian coordinates.	07

OR

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| Q.5 | (a) | Explain Molar Concentration and Molar Fraction. | 03 |
| | (b) | Explain: absorptivity, reflectivity, transmissivity. | 04 |
| | (c) | Explain Planck's Law of radiation | 07 |
