

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER– IV EXAMINATION – SUMMER 2026****Subject Code:3140411****Date:30-05-2026****Subject Name: Chemical Engineering Fundamentals I****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) State the dimensions of following physical quantities a) Pressure b) Density c) Molar heat capacity	03
	(b) State general laws of heat transfer for each mode of it.	04
	(c) Explain Newton's Law of viscosity	07
Q.2	(a) State the principal of hydrostatic equilibrium	03
	(b) State and explain Plank's Law	04
	(c) A gas mixture has the following composition by volume. Ethylene: 30.6%, Benzene: 24.5%, Oxygen: 1.3%, Methane: 15.5%, Ethane: 25.0%, Nitrogen: 3.1%. Find a) the average molecular weight of the gas mixture, b) the composition by weight, and c) the density of the mixture in kg/m ³ at STP.	07
	OR	
	(c) Explain : Ideal gas law, and Van der Waals equation	07
Q.3	(a) Discuss methods of solving material balance problems without chemical reaction.	03
	(b) Differentiate between Sensible heat and latent heat.	04
	(c) An evaporator system concentrating weak liquor from 5% to 50% solids handles 100 kg of solids per hour. If the same system is to concentrate a weak liquor from 4% to 35%, find the capacity of the system in terms of solids that can be handled per hour assuming water evaporation capacity to be same in both cases.	07
	OR	
Q.3	(a) Discuss uses of recycling and bypassing operation.	03
	(b) Define: i)Standard Heat of Formation ii)Standard Heat of Combustion	04
	(c) Explain bypass and purge streams with suitable diagram.	07
Q.4	(a) Define Drag force and Drag coefficient.	03
	(b) Explain Cavitation and Priming	04
	(c) Derive Bernoulli's equation and discuss the correction factors.	07
	OR	
Q.4	(a) What is aggregative and particulate fluidization?	03
	(b) Explain construction, working and calibration of Rotameter.	04
	(c) Derive continuity equation.	07
Q.5	(a) What is critical thickness of insulation?	03
	(b) Explain the concept of log mean temperature difference.	04
	(c) Differentiate between natural and forced convection with examples.	07
	OR	
Q.5	(a) State the significance of Nusselt Number	03
	(b) Compare co-current and countercurrent heat exchangers.	04
	(c) Derive the equation of rate of heat transfer in a composite wall.	07
