Enrolment No/Seat No.: _____

R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT

(An Autonomous Institute U/s UGC Act 1956)

B. TECH SEMESTER - I, SEMESTER END EXAMINATION – SUMMER 2025

Subject Code: 1CH101 **Date: 06-06-2025**

Subject Name: FUNDAMENTALS OF CHEMICAL ENGINEERING

Time: 11:00 AM to 01:30 PM **Total Marks: 70**

Instructions

1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper.
2. Write answers of **Section A** and **Section B** in **separate answer books**.
3. Attempt all questions from both **Section A** and **Section B**.
4. Each section carries **35 marks**, with a total of **70 marks** for the examination.
5. The figures to the right of each question indicate full marks, make suitable assumptions with justification.
6. BL - Bloom's Taxonomy Levels (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

SECTION A

		Marks	BL	CO
Q.1	**Multiple-Choice Questions**	**[05]**		
	(a) Which of the following is a type of thermodynamic system?	**1**	**R**	**4**
	(i) Open system **(ii)** Closed system **(iii)** Thermally isolated system **(iv)** All of the mentioned			
	(b) Which of the following is a thermodynamics law?	**1**	**R**	**4**
	(i) Zeroth law of thermodynamics **(ii)** Faraday's Law of thermodynamics **(iii)** Ideal Gas Law of thermodynamics **(iv)** Boyle's Law of thermodynamics			
	(c) What is the unit of diffusion coefficient?	**1**	**R**	**5**
	(i) m^2 **(ii)** s **(iii)** $m^2.s$ **(iv)** m^2/s			
	(d) Which of the following is a method of heat transfer?	**1**	**R**	**5**
	(i) Convection **(ii)** Radiation **(iii)** Conduction **(iv)** All of the mentioned			

(e) Which of the following is the rate of heat transfer unit?		**1**	**R**	**5**
(i) Watt	**(ii)** Pascal			
(iii) Joule	**(iv)** Newton			

Q.2 Attempt Any Two **[10]**

(a) Explain modes of heat transfer also write various law's applicable to it.	**5**	**U**	**5**
(b) Explain the importance of heat transfer operation in chemical industry.	**5**	**U**	**5**
(c) Explain classification of mass transfer operations.	**5**	**U**	**5**

Q.3 Attempt Any Two **[10]**

(a) Explain phase rule with an example.	**5**	**U**	**4**
(b) Define concept of internal energy, enthalpy and entropy.	**5**	**R**	**4**
(c) Compare system and surrounding in detail.	**5**	**U**	**4**

Q.4 Attempt Any Two **[10]**

(a) Explain the importance of mass transfer operation in chemical industry.	**5**	**U**	**5**
(b) Explain Dalton's law and Henry's law.	**5**	**U**	**5**
(c) Write basic difference between evaporation, boiling, cooling and condensation.	**5**	**R**	**5**

SECTION B

		Marks	BL	CO
Q.5	**Multiple-Choice Questions**	**[05]**		
	(a) Which of the following is a fundamental unit in the SI system?	**1**	**R**	**2**
	(i) Newton **(ii)** Pascal **(iii)** Meter **(iv)** Joule			
	(b) Which of these quantities is a derived unit?	**1**	**U**	**2**
	(i) Time **(ii)** Mass **(iii)** Length **(iv)**Velocity			
	(c) The average molecular weight of a gas mixture is calculated using	**1**	**A**	**2**
	(i) Weight percent of gases **(ii)** Volume percent of gases **(iii)** Mole fraction and molecular weight of each component **(iv)** Normality			
	(d) What is the molarity of a solution containing 1 mole of solute in 2 liters of solution? _____	**1**	**A**	**2**
	(i) 0.5 M **(ii)** 1 M **(iii)** 2 M **(iv)** 0.2 M			
	(e) What is the correct unit for density in the SI system?	**1**	**R**	**2**
	(i) Kg **(ii)** m^3/kg **(iii)** kg/m^3 **(iv)** N/m^2			
Q.6	**Attempt Any Two**	**[10]**		
	(a) Define unit operations and unit processes with examples.	**5**	**R**	**1**
	(b) Define steady state and unsteady state conditions in a chemical process.	**5**	**R**	**1**
	(c) Explain the significance of co-current, counter-current, and cross-current flow patterns in process design.	**5**	**U**	**1**
Q.7	**Attempt Any Two**	**[10]**		
	(a) A pressure gauge on a chemical reactor shows a reading of 50 psi. Using appropriate unit conversions, calculate the pressure in Pascals and atmospheres.	**5**	**A**	**2**
	(b) Define atomic weight, equivalent weight, and mole.	**5**	**R**	**2**
	(c) Define: mole percent, molarity, and density.	**5**	**R**	**2**

Q.8	**Attempt Any Two**	**[10]**		
	(a) Explain the importance of fluid flow operations in the chemical industry.	**5**	**U**	**3**
	(b) Classify fluids based on their flow behavior with examples.	**5**	**U**	**3**
	(c) State Newton's law of viscosity.	**5**	**R**	**3**

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