P P SAVANI UNIVERSITY

3rd Semester of B. Tech. Examination

November 2022

SECH2010 Chemical Process Calculations

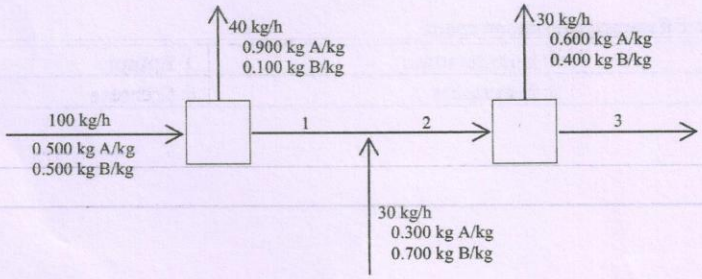
26.11.2022, Saturday **Time: 10:00 a.m. To 12:30 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1	In a distillation column for a feed of1000 kg the output is 80% of the feed and remaining 20% is waste. The feed contains 20% of Acetone and rest Water. The product contains 20% of Acetone and 40% of Water. (a) How much Acetone is there in waste? (b) Moles of water in waste?	**[05]**	**CO 2**	**BTL 5**
Q - 2	A labeled flowchart of a continuous steady-state two-unit distillation process is shown below. Each stream contains two components, A and B, in different proportions. Three streams whose flow rates and/or compositions are not known are labeled 1, 2 and 3. Calculate the unknown flow rates and compositions of streams 1, 2, and 3.	**[10]**	**4**	**4**



Q - 3	A membrane is used for separation of gases from waste. If the feed stream contains 20% CO_2 and 80% SO_2 and the product contains 25% of CO_2 and 75% of SO_2. Assume that the waste stream amounts to 80% of the input stream. (a) What is the composition of CO_2 in waste stream? (b) What is the composition of SO_2 in waste stream?	**[10]**	**3**	**5**
Q - 4	(Attempt all).	**[05]**	**1**	
(a)	Write the numerical quantity of Universal Gas Constant, R			**1**
(b)	Explain weight percent.			**2**
(c)	Explain mole percent.			**2**
(d)	What are the basic quantities used in SI system?			**1**
(e)	Definition of ideal gas law			**1**

SECTION – II

Q - 1	Attempt all	**[05]**		
(a)	What is the volume of 25 kg of chlorine gas at Normal Temperature and		**1**	**3**

	Pressure?			
(b)	Define the following conversion and yield.		**1**	**1**
Q - 2 (a)	To obtain a 100 Kg of 40 % N_2 solution, how much nitrogen must be added to a 20% nitrogen solution?	**[05]**	**2**	**5**
Q - 2 (b)	An aqueous solution with NaOH 10 g/L at the rate is 100 L/min and an organic compound with no NaOH at the rate 50 L/min were put into an extraction machine and produced aqueous solution with NaOH 1 g/L, what is the amount of NaOH in organic compound after extraction?	**[05]**	**2**	**5**
Q - 3	In a reactor, the feed components are NaOH, H_2O and HCl. The mass fractions of these components in feed are 0.3, 0.5, 0.2 respectively. The total amount of feed is 800 Kg. At the product side, the total amount of product is 400 Kg and amount of H_2O collected is 300 Kg. The mass ratio of NaOH and HCl is 0.6. Assume that there is no reaction is occurring in the reaction. (a) What is the amount of NaOH present in the feed? (b) What is the amount of HCl present in the feed? (c) What is the amount of H_2O present in the feed? (d) What is the amount of NaOH present in the product? (e) What is the amount of HCl present in the product?	**[10]**	**4**	**5**
Q - 4	Attempt all	**[05]**	**1**	
(a)	Define molality and molarity.			**1**
(b)	Explain the difference between the recycle and bypass stream with diagram.			**1**

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CO : Course Outcome Number BTL : Blooms Taxonomy Level

Level of Bloom's Revised Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create