Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2022

Subject Code:3170411 Date:03/06/2022

Subject Name:Downstream Processes

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)**	What is role of downstream processing in a biochemical industry?	**03**
	(b)	How the same Stoke's law applies to sedimentation and centrifugation?	**04**
	(c)	In a laboratory test of the filtration of a cell culture, the following equation was obtained to describe the filtration: $$\frac{t}{(V/A)} = K1\,\frac{V}{A} + K2$$ Where K1 = 0.18 min/cm^2 and K2 = 0.017 min/cm. The cell slurry has a viscosity of 2cp, and the filter cake solids (dry basis) per volume of filtrate were 13 g/liter. The pressure drop for the filtration was 610 mm Hg (0°C). Determine the specific cake resistance α and the medium resistance Rm.	**07**
Q.2	**(a)**	Draw diagram of any two types of production centrifuge.	**03**
	(b)	Draw a flowchart to show various stages of Downstream process.	**04**
	(c)	What are selection criteria for cell disruption process? Explain any one method with its advantages and disadvantages.	**07**
		OR	
	(c)	Enlist different methods for protein precipitation. Explain principle and working of any one method in detail.	**07**
Q.3	**(a)**	Explain principle of extraction.	**03**
	(b)	Explain different adsorbents used as stationary phase in column chromatography.	**04**
	(c)	We are planning to recover an antibiotic from 10 litres of feed solution by adsorption using activated carbon. The concentration of the antibiotic in the feed is 1.1 x 10^{-6} g per g of water. Above adsorption follows Freundlich isotherm. The isotherm is: $C_B = 2.51C_U^{0.288}$ How much adsorbent is required for 95 % recovery of the antibiotic?	**07**
		OR	
Q.3	**(a)**	What are gradient makers?	**03**
	(b)	What is a supercritical fluid? What are its characteristics?	**04**
	(c)	Give a schematic diagram of chromatographic setup and describe functions of the components.	**07**

Q.4	**(a)**	What are selection criteria for solvents in liquid liquid extraction process?	**03**
	(b)	How can membrane fouling be overcome?	**04**
	(c)	Explain principle and working of ion exchange chromatography.	**07**
		OR	
Q.4	**(a)**	Give broad classification of bioproducts in reference to its separations.	**03**
	(b)	Draw diagram of high speed ball mill homogenizer.	**04**
	(c)	Two proteins of molecular weight 2.5 x 105 and 1 x 104 were eluted out of a gel filtration column at 220 ml and 300 ml respectively. Determine molecular weight of a protein which elutes out at 270 ml from the column under the same conditions. The relation follows as $V_e = a - b \log M$.	**07**
Q.5	**(a)**	What are advantages of crystallization as a finishing operation in bioseparations?	**03**
	(b)	Write a note on lyophilization.	**04**
	(c)	Explain principle and working of affinity chromatography.	**07**
		OR	
Q.5	**(a)**	Why is formulation a necessary step in finishing operation?	**03**
	(b)	What are flocculants? Give its properties.	**04**
	(c)	Explain process of fixed bed adsorption.	**07**

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