Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023

Subject Code:3170411 Date:14-12-2023

Subject Name:Downstream Processes

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)**	Write down stoke's law for centrifugation.	**03**
	(b)	Discuss the stages of Downstream operations.	**04**
	(c)	Explain bead mill technique for cell disruption.	**07**
Q.2	**(a)**	What is dead end filtration and cross flow filtration?	**03**
	(b)	Explain considerations to be made for design of sterile filter.	**04**
	(c)	Explain design and working of any continuous filtration equipment.	**07**
		OR	
	(c)	Draw and explain design of any one cross flow filtration equipment.	**07**
Q.3	**(a)**	Give difference between precipitation and crystallization.	**03**
	(b)	Explain Freundlich Adsorption Isoterm.	**04**
	(c)	Explain single stage extraction with diagram.	**07**
		OR	
Q.3	**(a)**	Explain the principle of affinity chromatography.	**03**
	(b)	Explain gradient elution.	**04**
	(c)	Explain working and application of molecular sieve chromatography.	**07**
Q.4	**(a)**	Explain chemical method of cell disruption.	**03**
	(b)	Derive Darcy's law	**04**
	(c)	It is desired to filter a cell broth at a rate of 2000 liters/h on a rotary vacuum filter at a vacuum pressure of 70 kPa. The cycle time for the drum will be 80 s, and the cake formation time (filtering time) will be 15 s. The broth to be filtered has a viscosity of 2.0 cp and a cake solids (dry basis) per volume of filtrate of 10g/l. The specific cake resistance has been determined to be 9×10^{10} cm/g. Determine the area of the filter that is required. The resistance of the filter medium can be neglected.	**07**
		OR	
Q.4	**(a)**	What are considerations to be made in selection of solvent for liquid liquid extraction?	**03**
	(b)	Explain salting out method of precipitation.	**04**

	(c)	To achieve complete recovery of bacterial cells from a fermentation broth with a pilot plant scale tubular centrifuge. It has been already determined that the cells are approximately spherical with a radius of 0.5µm and have a density of 1.10 g/cm^3. The speed of the centrifuge is 5000 rpm, the bowl diameter is 10 cm, the bowl length is 100 cm, and the outlet opening of the bowl has a diameter of 4 cm. Estimate the maximum flow rate of the fermentation broth that can be attained.	**07**
Q.5	**(a)**	Explain enzymatic method of cell disruption	**03**
	(b)	Write a note on membrane fouling	**04**
	(c)	Explain working and application of Ion exchange chromatography.	**07**
		OR	
Q.5	**(a)**	Explain physical method of cell disruption.	**03**
	(b)	Write importance as well as disadvantages of filter aids.	**04**
	(c)	Explain components and working of HPLC.	**07**

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