Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(NEW) EXAMINATION – SUMMER 2019

Subject Code:2170403 Date:14/05/2019

Subject Name:Bioprocess Plant Design

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. **Notations used, have conventional meaning.**
5. **Assume suitable data wherever necessary.**

Q.1	**(a)**	Define: Stress, Strain, Modulus of Elasticity.	**03**
	(b)	Discuss the factors affecting the fluid allocation in Shell and Tube heat exchanger brief.	**04**
	(c)	Draw the neat sketch of various types of flanges used in industries.	**07**
Q.2	**(a)**	Explain in brief: Design Temperature & Design Pressure	**03**
	(b)	Define the term relative volatility and its importance.	**04**
	(c)	Discuss different types of heads used in the industry with neat sketch..	**07**
		OR	
	(c)	Explain different types of heads used in the industry with neat sketch.	**07**
Q.3	**(a)**	Discuss the advantages and disadvantages of vacuum distillation in detail.	**03**
	(b)	Write a short note on: Process Flow Diagram.	**04**
	(c)	Write a short note on selection of equipment for distillation.	**07**
		OR	
Q.3	**(a)**	Discuss the term: Design stress & Poisson's ratio	**03**
	(b)	Give classification of Nozzle stating the importance of each.	**04**
	(c)	Explain the various types of flanges used in industry with neat sketch.	**07**
Q.4	**(a)**	Write the full form of HTRI, HTFS & HEI.	**03**
	(b)	Explain the types of jacket in brief.	**04**
	(c)	Write a note on corrosion allowance & weld joint efficiency factor (j).	**07**
		OR	
Q.4	**(a)**	Write the function of coil in reactor with its importance.	**03**
	(b)	State the various types of agitators used in the reactor.	**04**
	(c)	Describe Mc Cabe Thiele method for Distillation.	**07**

Q.5 A single effect evaporator is to be designed to concentrate 9000 kg/hr of a solution from 12% to 20% solids. Feed enters at 25 °C. Saturated steam at 110 °C (latent heat = 540 kcal/kg) is available. The condensate leaves at the condensing temperature. Saturation temperature of vapor to the condenser is 400C (λ = 580 kcal/kg). Specific heat of all solutions may be taken as 1 kcal/kg°C. Boiling point rise is 5°C. The evaporator has an overall heat transfer coefficient of 1900 kcal/hr.m2.°C. Calculate: i) evaporator capacity, ii) evaporator economy, iii) The area of heating surface required. Use 1 kcal = 4186 J. **14**

OR

Q.5 Data for pressure vessel are given below: **14**

- Capacity : 10000 L (cylindrical portion only), Operating pressure = 10kg f/cm2
- f = 980kg/cm2, Density of steel = 7.7gm/cc , J = 0.85
- Torspherical heads are provided at both sides.
- For torispherical head, Rc = 10% excess of I.D., R1 = 10% of Rc

Taking L/D = 5, calculate and suggest the plate thickness of shell. Also calculate the thickness of torispherical head and total weight of shell with heads.

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