Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI(NEW) – EXAMINATION – SUMMER 2019

Subject Code:2163506   **Date:10/05/2019**
**Subject Name:Unit Operations-II**
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.

Q.1*	**(a)**	Explain Reverse osmosis with proper diagram.	03
	(b)	Differentiate Pyrolysis and Incineration.	04
	(c)	A batch of 120 Kg wet solid has initial moisture content of 0.4 Kg water/Kg dry solid. The exposed area for drying is 0.05 m^2/Kg dry solid. The rate of drying follows the following curve. Calculate the time required (in hours) for drying this batch to a moisture content of 0.1 Kg water/Kg dry solid.	07
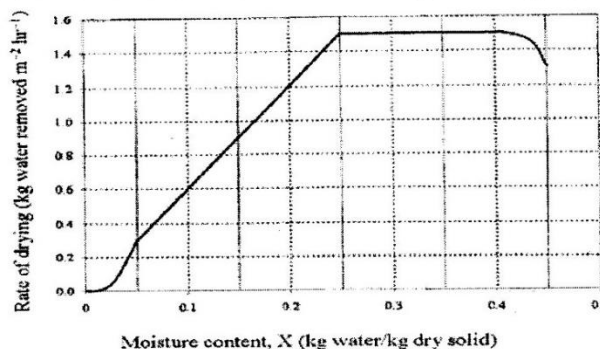
Q.2	**(a)**	Explain Pneumatic Conveyers with proper diagram.	03
	(b)	Explain drying rate curve.	04
	(c)	Explain the troubles occurs in Rapid sand filters with proper diagram.	07
		OR	
	(c)	Classify types of dryers and explain any two with proper diagram.	07
Q.3	**(a)**	Differentiate cross flow and ded-end flow of membrane.	03
	(b)	Explain different types of membrane.	04
	(c)	Describe different types of membrane module (with figure) and working principal of microfiltration.	07
		OR	
Q.3	**(a)**	Explain types of fouling in the membrane.	03
	(b)	Explain different types of membrane modules.	04
	(c)	Explain fluidization process and derive the equation of pressure drop per unit length in the column.	07
Q.4	**(a)**	Define (a) Equilibrium moisture (b) Free moisture (c) Bound moisture (d) Un-bound moisture.	03
	(b)	Explain selection criteria for absorbent.	04
	(c)	Calculate the time required to reduce the moisture contents of a solid from 0.66 to 0.25 Kg moisture/Kg dry solid. The rate of drying N (Kg Water evaporated/m^2 s) is given as following,	07

$$N = 0.0015 \, X \text{ for } X \leq 0.3$$

$$= 0.00045 \quad \text{for } X > 0.3$$

where X = Kg moisture/Kg dry solid. The drying surface is 0.025 m²/Kg dry solid.

OR

Q.4 **(a)** Write a short note on clarifocculatotr.   **03**

(b) Explain $(Ls/Gs)_{min}$ Ratio theory in Absorption process.   **04**

(c) A 25 x 25 x 1 Cm flat sheet weighing 1 Kg initially was dried from both side   **07**
under constant rate condition. It took 1200 sec for the weight of sheet to
reduce to 0.80 kg Another 1 X 2 X 2 m flat sheet of the same material is to
be dried from one side only. Under the same constant rate drying condition
Calculate the time required for drying (in hours) from its initial weight of 19.2
Kg to 17.6 kg.

Q.5 **(a)** Explain working principal of Microfiltration, Advantages and   **03**
disadvantages.

(b) Derive the equation for falling rate drying assuming entire linear falling rate.   **04**

(c) **Absorber:** Gas in 0.250 m³/s at 26 °C , P_t = 1.07 x 10⁵ N/m² Containing 2 %   **07**
by volume of light oil vapors. The light oil will be assumed to be entirely
benzene and a 90% removal is required. The wash oil is to enter at 26 °C,
containing 0.005 mole fraction benzene and has an average molecular weight
is 260. An oil circulation rate of 2 times the minimum is to be used. Wash oil
benzene solution are ideal. Calculate Actual liquid flowrate and Mole fraction
of benzene actually coming out of the tower in the liquid.

Data: The vapor pressure of benzene at 26 °C is 13330 Pa.

OR

Q.5 **(a)** Explain ultrafiltration.   **03**

(b) What are the types of scrubber and explain any one.   **04**

(c) In a Petrochemical Plant gas containing 4 % cyclohexane and rest is inert has   **07**
to be treated with a non-volatile absorption oil in a packed tower. It is required
to removed 94 % of the cyclohexane of the feed gas. The feed solvent is free
from cyclohexane. If the feed gas rate is 70 kmol/hr. Calculate the minimum
solvent rate at the equilibrium relationship $Y = \dfrac{0.2\,X}{1+0.8\,X}$