Seat No.: _____   Enrolment No._____

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

Subject Code:2160405   **Date:14/05/2019**

Subject Name:Principles of Process Engineering-III

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.**

MARKS

Q.1	**(a)**	Explain Raoult's law with suitable assumptions.	**03**
	(b)	What is humidification ?Write the application of claypeyron equation	**04**
	(c)	Explain differential distillation and derive Rayleigh equation differential	**07**
Q.2	**(a)**	Define: 1). Dry bulb temperature 2) Free moisture 3)Critical moisture	**03**
	(b)	Compare Azeotropic and Extractive distillation	**04**
	(c)	What is Azeotropes? Explain positive and negative deviation from ideality with examples.	**07**
		OR	
	(c)	Explain step wise procedure of Mac-cabe Thiele method for obtaining numbers of theoretical trays with suitable assumptions.	**07**
Q.3	**(a)**	Difine: 1) Molal absolute humidity 2) Relative humidity 3) Humid volume	**03**
	(b)	Explain types of adsorptions in brief.	**04**
	(c)	A feed solution contains 100 moles of Benzene- Toluene mixture having 70 mol % benzene. One third of feed is vaporized. The total pressure is 1 atmosphere. Calculate the distillate and bottom composition by using flash distillation. Average relative volatility of solution mixture is 2.5.	**07**
		OR	
Q.3	**(a)**	Discuss the effect of impurities in crystallization.	**03**
	(b)	Explain construction and working of Tray drier.	**04**
	(c)	Explain Mier's theory of super saturation with neat sketch.	**07**
Q.4	**(a)**	Write the detailed classification of cooling towers.	**03**
	(b)	Explain flash distillation with neat sketch.	**04**
	(c)	Explain selection criteria of adsorbent in detail.	**07**
		OR	
Q.4	**(a)**	Write note on adsorption from concentrated liquid solution.	**03**
	(b)	Explain effect of temperature and pressure on adsorption.	**04**
	(c)	A mixture of benzene and toluene containing 45 mole % benzene is to be separated to give an overhead product of 95 mole % benzene and a bottom product containing 5 mole % benzene. The feed is at its boiling point, and the vapor leaving the column is condensed but not cooled and provides reflux and product. Equilibrium data for mol fractions of benzene in liquid, x and vapor, y is given as follows:	**07**

x	0.78	0.581	0.411	0.258	0.130	0.017
y	0.90	0.777	0.632	0.486	0.261	0.039

Q.5	**(a)**	Derive equation for constant rate drying period.	**03**
	(b)	Discuss agitated batch crystallizer with a neat diagram.	**04**
	(c)	What is reflux ratio? Explain Total, Minimum and Optimum reflux ratio.	**07**

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OR

Q.5	**(a)**	Derive equation for falling rate period.	**03**
	(b)	A filter cake is dried for 5 hours from an initial moisture content of 30% to 10% (wet basis). Calculate the time required to dry the filter cake from 30% to 6% (wet basis). Equilibrium moisture content is 4% on dry basis and Critical moisture content is 14% on dry basis.	**04**
	(c)	Explain with a neat diagram, principle and working of Rotary Dryer.	**07**

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