

Reg.No. _____

**Karunya UNIVERSITY**(Karunya Institute of Technology & Sciences)
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)**End Semester Examination – Nov/Dec – 2016****Code:14BT2049****Sub. Name : Process equipment Design****Semester : VII sem****Duration : 3hrs****Max. marks : 100****ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	Discuss about the unit operations and unit process and give few examples with neat schematic diagram.	CO1	10
	b.	Describe about engineering materials selection for design of process equipments	CO1	10
(OR)				
2.	a.	Draw a neat plant layout of ethanol production.	CO1	10
	b.	What are the parameters required for selection of the plant location.	CO1	10
3.	a.	Discuss about fluid flow control equipment in process area.	CO2	10
	b.	Write the design procedure of venturymeter with neat sketch	CO2	10
(OR)				
4.	a.	A properly designed venturimeter has a throat diameter of 30 cm and inlet opening, diameter of 60 cm. If it is inserted in a pipe line of 60cm through which dry chlorine gas is flowing, the reading of the venturimeter connected to a U tube mercury manometer is 1.3 cm of mmHg. Calculate the rate of flow of chlorine gas in kg/ hr. Assume the density of mercury to be 13.6 gm/cc and that of chlorine gas at the conditions involved as 0.009gm/cc. The coefficient of discharge of venturimeter can be taken as 0.98.	CO2	20
5.	a.	Give the design procedure step by step about the shell and tube heat exchanger	CO3	5
	b.	A single effect evaporator is fed with 10000 kg/ hr of solution containing 10% solution by weight. Feed temperature is 303K and is to be concentrated to a solution of 20% solute by weight. The evaporator is at atmospheric pressure (101.325 k pa) and area of evaporator is 138m ² . Saturated steam is supplied at 143.3 k pa as a heating medium. Calculate steam economy and overall heat transfer coefficient. If the no of tube is 150, find out the length of tubes. Data: Enthalpy of feed at 303K = 125.79 kJ/ kg, Enthalpy of vapour at 101.325 kpa = 2676.1 kJ/ kg, Enthalpy of saturated steam at 143.325 kpa = 2691.5 kJ/kg, Enthalpy of product = 419.1 kJ/kg, Enthalpy of saturated water at 383K = 461.30 kJ/kg, Saturation temperature of steam = 383K Boiling point of solution = boiling point water = 373K.	CO3	15
(OR)				
6.	a.	Crude oil flows at the rate of 1000kg/hr through the inside pipe of a double pipe heat exchanger and is heated from 30 °C to 90 °C. The heat is supplied by kerosene initially at 200 °C flow through the annular space. If the temperature of approach (minimum temperature difference) is 10 °C, Determine the heat transfer area for co current flow and kerosene flow rate. Data : Specific heat of crude oil = 0.5 kcal/ kg °C, Cp of kerosene is 0.6 kcal/ kg °C and Uo = 400 kcal/ hr m ² °C.	CO3	10
	b.	Derive and express the design of single effect evaporator with neat schematic diagram.	CO3	10

7.	a.	It is desired to fractionate a feed mixture of ethanol and propanol containing 65mol%ethanol.To a distillate containing 92mole% ethanol and a residue containing 93mole%propanol.The feed enters as a saturated vapour. i) determine the minimum reflux ratio ii) for a reflux ratio of 4, determine the theoretical number of plates needed and iii)locate the feed plate point at its boiling point.	CO4	20																				
		<table><tr><td>x</td><td>0</td><td>0.1</td><td>0.2</td><td>0.3</td><td>0.5</td><td>0.7</td><td>0.8</td><td>0.9</td><td>1.0</td></tr><tr><td>y</td><td>0</td><td>0.19</td><td>0.34</td><td>0.47</td><td>0.67</td><td>0.83</td><td>0.89</td><td>0.95</td><td>1.0</td></tr></table>	x	0	0.1	0.2	0.3	0.5	0.7	0.8	0.9	1.0	y	0	0.19	0.34	0.47	0.67	0.83	0.89	0.95	1.0		
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(OR)																								
8.	a.	1000 kg moles/hr of an ethanol propanol mixture containing 65moles% is to separated in a continuous plate column operating at 1 atmosphere total pressure. The desired terminal composition in units of mole fraction of ethanol are XD=0.92, Xw=0.07.The feed is a saturated vapour and total condenser is used. When the reflux flow rate is four times the amount of top product, find the number of theoretical plates required for the separation. Relative volatility=2.10.	CO4	15																				
	b.	What is the relationship between Number of theroitcal plates and Reflux ratio	CO4	5																				
		<u>Compulsory:</u>																						
9.	a.	Write down the designing procedure step by step of an ideal batch reactor?	CO5	10																				
	b.	Discuss about batch reactor and continuous reactor.	CO5	10																				

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