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 : 14FP3021
Sub. Name : Design of Food Processing Equipments

Semester : 2016-17 ODD
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 various non metals used as a construction material in process industries	CO3	**15**
	b.	What is the advantage of multiple effect evaporator over single effect evaporator	CO2	**5**
		(OR)		
2.	a.	What are the various classifications of heat exchangers, explain the construction operation merit and demerits of double pipe heat exchangers	CO2	**15**
	b.	How the heat transfer co efficient of viscous liquids can be enhanced mechanically	CO2	**5**
3.	a.	What is the role of composite wall in designing cold storage room	CO2	**6**
	b.	Calculate the rate of heat loss for a red brick wall of length 5m, height 4m and thickness 0.25m. The temperature of inner surface is 110°C and the outer surface is 40°C. The thermal conductivity of the red brick is, K = 0.7 W/m K. Also calculate the temperature at an interior point of the wall 20 cm distance from the inner wall.	CO2	**14**
		(OR)		
4.	a.	Derive material and energy balance equation for the case of double effect evaporator with suitable sketch	CO2	**15**
	b.	What is the advantage of forward feed compared with backward feed for the case of multiple effect evaporator	CO2	**5**
5.	a.	What are the important assumptions made in deriving the design equation for Plug Flow Reactor (PFR). From material balance obtain the design equation for PFR.	CO2	**15**
	b.	What are the reson for non ideality in continuous reactors	CO2	**5**
		(OR)		
6.	a.	A batch of solids is to be dried from 28% to 6% moisture on wet basis. The initial weight of the solid is 380 Kg and the drying surface is 0.15 m^2/40 kg dry weight. The critical moisture content is 18% dry basis and the constant drying rate is 0.32 kg/m^2. h. For the falling rate period, the following data are available.	CO2	**15**

Moisture content, % dry basis	25	21.9	19	16	13.6	11	8.2	7.5	6.4
Rate of drying Kg/m^2.h	0.3	0.27	0.24	0.21	0.18	0.15	0.07	0.044	0.025

	b.	Differentiate critical moisture content and equilibirium moisture content	CO2	**5**
7.	a.	Derive the expression for the total time required for drying solids under constant drying conditions	CO2	**12**

	b.	What are the advantages and disadvantages of solar dryer in drying agriculture produce	CO2	**8**
		(OR)		
8.	a.	Acetic anhydride is hydrolyzed in a CSTR by using large excess of water. The concentration of acetic anhydride in the initial mixture is C_{A0} 0.3 mole/lit. The degree of conversion with respect to the initial mixture is 0.7. The volumetric flow rate of initial mixture is 20 lit/min. The reaction is first order having reaction rate constant K = 0.38 min^{-1}. Estimate i). Volume of a single CSTR required for the desired degree of conversion. ii). Volume of the plug flow reactor for the same process.	CO2	**15**
	b.	Define space time and spece velocity in the case continuous stirred tank reactor	CO2	**5**
		Compulsory:		
9.	a.	A single effect evaporator is to be designed to concentrate 10,000 Kg/hr of a chemical solution from 10% to 20% solids by weight. Feed enters at 30°C. Saturated steam at 110°C (latent heat 540 kcal/kg) is available. Condensate leaves at saturation temperature. The solution boils at 45°C (latent heat 570 kcal/kg). Specific heats of all solutions may be taken as 1.0. Overall heat transfer co efficient may be taken as 1800 Kcal/hr m^2°C. Calculate i) steam consumption ii) Heat transfer area	CO2	**15**
	b.	Draw the symbol for heat exchanger and packed column	CO2	**5**

ALL THE BEST