Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**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**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **14FP3021** | **Duration :** | **3hrs** |
| **Sub. Name :** | **Design of Food Processing Equipments** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **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 m2/40 kg dry weight. The critical moisture content is 18% dry basis and the constant drying rate is 0.32 kg/m2. h. For the falling rate period, the following data are available.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Moisture content, % dry basis | 25 | 21.9 | 19 | 16 | 13.6 | 11 | 8.2 | 7.5 | 6.4 | | Rate of drying Kg/m2.h | 0.3 | 0.27 | 0.24 | 0.21 | 0.18 | 0.15 | 0.07 | 0.044 | 0.025 | | CO2 | 15 |
| 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 CA0 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 m2°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