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

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **14BT2051** | **Duration :** | **3hrs** |
| **Sub. Name :** | **PILOT PLANT & SCALE UP PRACTICE** | **Max. marks :** | **100** |

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

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. |  | Briefly explain the process development? | CO1 | 20 |
| (OR) | | | | |
| 2. | a. | Explain pilot plant operations. | CO1 | 10 |
| b. | Write a short notes on scale up. |  | 8 |
| c. | Define: A Model. |  | 2 |
|  |  |  |  |  |
| 3. |  | List and briefly explain the steps in the new product development process? | CO1 | 20 |
| (OR) | | | | |
| 4. |  | Describe the process model? | CO1 | 20 |
|  |  |  |  |  |
| 5. |  | Briefly explain the steps involved in design of heat exchanger. | CO1 | 20 |
| (OR) | | | | |
| 6. |  | The feed capacity of 1000kg/hran evaporator contains 8% solute by weight. The feed is a 35°C which is concentrated to a solution of 25% solute per weight. The evaporator is operating with atomsperic pressure in the vapour space. Steam is supplied 1.4 kg/cm3.Boiling point evaluation is negligible. Properties of solution may be taken as that of water. 750 kcal/hr m2 °C may be taken as overall heat transfer coefficient of evaporator. Calendria is of mild steel tubes inner diameter 16mm,outer diameter 19mm and 24mm triangular pitch may be assumed. Design an evaporator. | CO2 | 20 |
|  |  |  |  |  |
| 7. |  | Briefly explain the steps involved in design of dryer? | CO2 | 20 |
| (OR) | | | | |
| 8. |  | A rotary dryer is used to dry 10,000 kg/hr of wet solid containing 8% weight water to 0.1% weight. The wet solid enters the dryer at 26°C. Ambient air inside 26°C dry bulb temperature and 17°C wet bulb temperature will be heated to 150°C in a first tube heater using steam at 10.5kg/cm2. The specific heat of solid salt is 879.2J/kg K. Estimate the length and diameter of the dryer required? | CO2 | 20 |
|  | |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. |  | A 1-4 shell and tube heat exchanger is to be designed to cool 0.75x106 L/hr of ammonia gas from 118°C to 35°C at 12x105 N/m2 in shell side. Cooling water is heated simultaneously in tubes from 29.5°C to 35°C. Water is flowing at 1.1m/sec in tubes from each of which is 1m long. The tubes have been outer diameter 0.0508m and thickness 2mm are selected. The tubes are placed in triangular pitch of 0.24m, shell internal diameter is 0.7m, baffles space is 0.35m. The total allowable pressure drop is 0.35x105N/m2. 25% baffle heads are used. Calculate the number of tubes and the dimensions of heat exchanger?   |  |  |  | | --- | --- | --- | | Component | Ammonia | Water | | Temperature at (°C) | 76.5 | 32.25 | | Specific heat (J/kg.K) | 2219.11 | 4187 | | Density (kg/m3) | 7.0181 | 994.946 | | Thermal conductivity (W/m K) | 3.04x10-2 | 0.628 | | Viscosity (x104)(kg/m.s) | 0.12 | 8.25 |   Rd = 8.805x10-4 s.m2K/J ; FT=0.9 | CO3 | 20 |