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



**End Semester Examination – Nov/Dec – 2017**

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

*(Additional graph sheets are permitted)*

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

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| --- | --- | --- | --- | --- |
| **Q. No.** |  | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. |  | Draw a plant layout of a pharmaceutical industry and explain its parts in detail. | CO1 | 20 |
| (OR) | | | | |
| 2. |  | Explain various analog models. | CO1 | 20 |
|  |  |  |  |  |
| 3. |  | Calculate the total length of the double pipe heat exchanger required to cool 5500 kg/hr of ethylene glycol from 358K to 341K using toluene as a cooling media which follows in a counter current flow fashion. Toluene enters at 303K and leaves at 335K. Outer diameter of outer pipe is 70 mm. Outer diameter of inner pipe is 43 mm, wall thickness of both pipes is 3mm.  Thermal conductivity of metal pipe is 46.52 W/m.K and ethylene glycol is flowing through the inner pipe.   |  |  |  | | --- | --- | --- | | **Property** | **Ethylene glycol** | **Toluene** | | Density | 1080 kg/m3 | 840 kg/m3 | | Specific heat | 2.680 kJ/kg.K | 1.80 kJ/kg.K | | Thermal conductivity | 0.248 W/m.K | 0.146 W/m.K | | Viscosity | 3.4 x 10-3Pa.s | 4.4 x 10-4Pa.s | | CO1 | 20 |
| (OR) | | | | |
| 4. |  | Discuss the power consumption for agitator? | CO2 | 20 |
|  |  |  |  |  |
| 5. |  | To design a single effect evaporator is operating at atmospheric pressure. It is decided to concentrate the feed from 5% solute to 20% solute at rate of 5000 kg/hr. Saturation steam at pressure corresponding to the saturation temperature of 399K. The feed is at 298K and the boiling point is 5K. Overall heat transfer coefficient 2350 W/m2K. Calculate the economics of evaporator, area of the heat transfer. | CO2 | 20 |
| (OR) | | | | |
| 6. |  | Demonstrate the designing steps in distillation column. | CO3 | 20 |
|  |  |  |  |  |
| 7. |  | A binary condition mixture of methanol and ethanol at equilibrium is to be separated by fractional column. Distillate product contain 95 mole%. The bottom product ethanol 95 mole%. Calculate the number of theoretical plate required at minimum reflex ratio at saturated liquid feed condition. When the overall plate efficiency 60%, find the actual plate required. | CO3 | 20 |
| (OR) | | | | |
| 8. |  | Explain process development methods in scale up practice. | CO3 | 20 |
|  | | **Compulsory**: |  |  |
| 9. |  | Illustrate the dimensional analysis for laminar flow and turbulent flow. | CO2 | 20 |

ALL THE BEST