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

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

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| **Code :** | **14BT2003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **PRINCIPLES OF CHEMICAL ENGINEERING** | **Max. marks :** | **100** |

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

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. |  | Air is pumped through an orifice immersed in liquid. The size of the bubbles leaving the orifice depends on the diameter of the orifice and the properties of the liquid. The equation representing this situation is    Where g = gravitational acceleration =32.174 ft/s2, ρL = liquid density = 1 gm/cm3, ρG = gas density = 0.081 lb/ft3 , Db = bubble diameter, σ = gas –liquid surface tension = 70.8 dyn/cm, Do = orifice diameter = 1 mm, Calculate bubble diameter Db in cm. | CO1 | 20 |
| (OR) | | | | |
| 2. | a. | Steam is flowing at the rate of 2000 kg/hr in a 3 inch NB 40 scheule pipe at 440 kPa (4.4 bar) absolute and 453 K (180OC). Calculate the linear velocity of the steam in the pipe line (SI). Given Internal diameter of the pipe is 3.068 inch. Specific volume of the steam at 440 kPa and 453 K is V =0.461 m3/kg. | CO2 | 10 |
| b. | The flow rate of water through a pipe is reported as 15 cubic feet per minute. Taking the density of water as 1 gm/cm3. Calculate the mass flow rate in kg/sec. | CO1 | 10 |
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| 3. |  | The solubility of sodium chloride in water at 290K is 35.8 kg/100 kg of water. Express the solubility as the following  a) Mass fraction and mass percent of NaCl (b) Mole fraction and mole percent of NaCl (c) Kmol NaCl per 1000 kg of water. | CO2 | 20 |
| (OR) | | | | |
| 4. | a. | A 150 lit cylinder contains gas at 300 K and 10 bar. What is the mass of O2 in the cylinder in STP condition. | CO2 | 10 |
| b. | Develop ideal gas equation with suitable assumptions and equations. | CO3 | 10 |
|  |  |  |  |  |
| 5. | a. | Coal contains 85% carbon and 15% ash. The cinder formed in the combustion of coal contains 80% ash and 20% carbon. Determine the weight of cinder formed by the combustion of 100 kg coal and the percentage of carbon converted to cinder. | CO3 | 16 |
| b. | Define tie element with suitable example. | CO3 | 4 |
| (OR) | | | | |
| 6. | a. | Explain the Drying mechanism with a suitable diagram of continuous rotary dryer. | CO3 | 10 |
|  | b. | In a textile mill, a double effect evaporator system concentrates weak liquor containing 4% (by mass) caustic soda to produce a lye containing 25% solids (by mass). Calculate the evaporation of water per 100 kg of feed in the evaporator. | CO3 | 10 |
|  |  |  |  |  |
| 7. |  | Explain the mechanism of triple effect evaporator system with suitable diagram and mass balance equations. | CO3 | 20 |
| (OR) | | | | |
| 8. |  | A triple effect evaporator is used to concentrate 1000 kg of aqueous solution from a concentration of 20% solute to 80% solute. Assuming an equal amount of vaporization in each effect. Calculate the composition, the weight of the solution entering the second and third effect evaporator. | CO2 | 20 |
|  | |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. |  | Explain the mechanism of Filtration process interms of solid –liquid separation with suitable equations. | CO3 | 20 |