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



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **18BT2003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **BIOPROCESS CALCULATIONS** | **Max. Marks :** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Marks** |
| **PART – A (10X1 = 10 MARKS)** | | | |
| 1. | Specify the dimension and unit of specific volume in FPS unit. | CO1 | 1 |
| 2. | Define work and mention its dimension and unit in MKS unit. | CO1 | 1 |
| 3. | Define the term “Mass Fraction” with suitable equation. | CO2 | 1 |
| 4. | Calculate the equivalent weight of CaCO3. | CO2 | 1 |
| 5. | N2 +3H2 = 2NH3, In the feed reaction mixture 20 moles of nitrogen and 80 moles of hydrogen is present, determine which one is the excess reactant. | CO3 | 1 |
| 6. | State Avogadros’s Principle or hypothesis. | CO4 | 1 |
| 7. | Mention one example of dimentionless number with its equation. | CO3 | 1 |
| 8. | Mention one application of Evaporation operation in industrial process. | CO6 | 1 |
| 9. | Define kinetic energy with suitable equation. | CO5 | 1 |
| 10. | State basic mass balance equation and mention its modification for continious process. | CO6 | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Prove 1 J =107 erg. | CO1 | 3 |
| 12. | If the temperature of a body is 41OF, what is the temperature in Celsius.  (Show calculation) | CO2 | 3 |
| 13. | State the basic properties of gases and Ideal gases. | CO4 | 3 |
| 14. | Assuming Air to behave as an ideal gas, Calculate the molar volume of air at 350K and 1 bar pressure. | CO3 | 3 |
| 15. | Derive Ideal gas equation with suitable assumptions. | CO4 | 3 |
| 16. | Explain the concept of Bypass with suitable diagram. | CO5 | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is a Compulsory Question)** | | | | | |
| 17. |  | Steam is flowing at the rate of 2000 kg/hr in NB SCHEDULE pipe at 440 kPa (4.4 bar) absolute and 453 k (180OC).Calculate the linear velocity of the steam in the pipe line.  Given : Diameter of the pipe line = 3.068 in, Specific volume of the steam at 440 kPa is 0.461 m3/kg. | | CO1 | 12 |
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| 18. |  | Sulphur trioxide gas is obtained by the combustion of iron pyrites (FeS2) according to the following equation 4FeS2 + 15O2 ---- 2Fe2O3 + 8 SO3  How many kilograms of pyrites are burned to obtain 100 kg of sulphur trioxide?  How many kilograms of O2 are consumed in the production of 50 kg of SO3 ? | | CO2 | 12 |
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| 19. |  | An analysis of the vent gases from the chlorinator in a plant for making chlorinated rubber should 70% by mole HCl, 20% by mole Cl2 and rest is CCl4. Determine the following.   1. The percent composition by weight 2. The average molecular weight of the gas   The density at standard condition (kg/m3) | | CO3 | 12 |
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| 20. |  | The diameter and height of a verticle cylinder tank are 5 ft and 6 ft 6 inch respectively. It is full upto 75 % height with carbon tetrachloride (CCL4). The density of carbon tetrachloride is 1.6 kg/L. Find the mass of CCL4 in Kg. | | CO1 | 12 |
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| 21. |  | A triple effect evaporator is used to concentrate 1000 kg aqueous solution from a concentration of 20% solute to 80% solute. Assuming an equal amount of vaporization in each effect, calculate the composition and weight of the solution entering the second and third effect. | | CO3 | 12 |
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| 22. |  | Eplain the concept of Drying and mechanism cylindrical drierwith suitable diagram. | | CO5 | 12 |
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| 23. |  | Develop an energy balance equation for open system. | | CO5 | 12 |
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|  | **Compulsory:** | | | | |
| 24. |  | Explain the concept of Recycle and Bypass with suitable diagram. | CO6 | | 12 |