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 :** | **14BT2003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **Principles of Chemical Engineering** | **Max. Marks:** | **100** |

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| **Q. No** | **Questions** | | | | **Course outcome** | | **Mark** | |
| **PART-A (40X1=40 MULTIPLE CHOICE QUESTIONS)** | | | | | | | | |
| 1. | SI unit for mass is \_\_\_\_\_\_\_\_\_\_ | | | | |  | |  |
|  | a. kg | b. pound | c. gram | d. sec | | CO1 | | (1) |
| 2. | fps unit for length is \_\_\_\_\_\_\_\_\_\_ | | | | |  | |  |
|  | a. foot | b. cm | c. m | d. gm | | CO1 | | (1) |
| 3. | Calculate the pressure (Nm-2) when the cross sectional area of pipe is 2 m2 and force is 25 N? | | | | |  | |  |
|  | a. 12.5 | b. 10. 5 | c. 13.5 | d. 8.5 | | CO1 | | (1) |
| 4. | Convert 35 m to feet | | | | |  | |  |
|  | a. 114.82 | b. 120.34 | c. 145.25 | d. 172.33 | | CO1 | | (1) |
| 5. | Convert 4 inch to cm | | | | |  | |  |
|  | a. 10.16 cm | b. 12.42 cm | c. 13.24 cm | d. 16.23 cm | | CO1 | | (1) |
| 6. | 14 is the molecular weight of \_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | |  | |  |
|  | a. N | b. O | c. C | d. K | | CO1 | | (1) |
| 7. | Molecular weight for sulphur | | | | |  | |  |
|  | a. 32 | b. 42 | c. 52 | d. 62 | | CO2 | | (1) |
| 8. | Calculate the partial pressure of H2 at 20 degree centigrade when the vaopur pressure of water is 17.5 torr. The total pressure of the gas is 750 torr. | | | | |  | |  |
|  | a. 732 | b. 823 | c. 923 | d. 574 | | CO2 | | (1) |
| 9. | Three ideal gases are mixed together in 500 lit containers. Ar has pressure 255 torr, N2 has a pressure of 228 torr and H2 has 752 torr. What is the total pressure in the container? | | | | |  | |  |
|  | a. 1235 | b. 1566 | c. 1788 | d. 1134 | | CO2 | | (1) |
| 10. | The molecular weight of a compound is 52 and its valency is 5, what will be the equivalent weight? | | | | |  | |  |
|  | a. 10.4 | b. 48.3 | c. 98.2 | d. 12.3 | | CO2 | | (1) |
| 11. | Binary mixture contains 15 kg of A and 16 kg of B, the mass % of ‘A’ component is \_\_\_\_\_\_ | | | | |  | |  |
|  | a. 48.3 | b. 5.45 | c. 60.54 | d. 54.54 | | CO1 | | (1) |
| 12. | The molecular weight of a compound is 67 and its valency is 2, what will be the equivalent weight? | | | | |  | |  |
|  | a. 33.5 | b. 48.3 | c. 29.2 | d. 12.3 | | CO1 | | (1) |
| 13. | Molecular weight of glucose (C12H22O11) is \_\_\_\_\_\_\_ | | | | |  | |  |
|  | a. 342.29 | b. 280.36 | c. 803.44 | d. 380.22 | | CO1 | | (1) |
| 14. | An object is moving at a speed of 20 m/s and KE of 10,000 J. What is the mass of the object. | | | | |  | |  |
|  | a. 50 kg | b. 40 kg | c. 20 kg | d. 30 kg | | CO1 | | (1) |
| 15. | How many grams of NH4Cl are there in 5 mole ? | | | | |  | |  |
|  | a. 267.5 gm | b. 300.5 gm | c. 468.66 gm | d. 789.55 gm | | CO1 | | (1) |
| 16. | How many atoms are present in 349.7 gm of NaCl. | | | | |  | |  |
|  | a. 36.017 \* 1023 | b. 26.017 \* 1023 | c. 46.017 \* 1023 | d. 56.017 \* 1023 | | CO2 | | (1) |
| 17. | How many grams of KCl would you need to add to 2 lit of water to make 0.5m solution. | | | | |  | |  |
|  | a. 74.55 | b.54.55 | c. 74.55 | d. 84.55 | | CO2 | | (1) |
| 18. | 10 moles of HCl dissolved in 1000 g of H2O. Find the molality of solution? | | | | |  | |  |
|  | a. 10 | b. 0.01 | c. 0.001 | d. 100 | | CO2 | | (1) |
| 19. | 1 inch to cm is | | | | |  | |  |
|  | a. 2.54 | b. 3.54 | c. 5.54 | d. 4.54 | | CO2 | | (1) |
| 20. | Convert 15 miles to km | | | | |  | |  |
|  | a. 24.140 | b. 34.140 | c. 44.140 | d. 54.140 | | CO2 | | (1) |

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| 21. | The process where there is no addition of input through out the processing time is called | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. Continuous Process | | | | | b. Batch Process | | | | c. Semi Batch | | | | | | d. Fed-Batch Process | | | | | CO2 | | (1) |
| 22. | How many grams of O2 are required to produce 0.3 mole of H2O  CH4 + 2O2  CO2+2H2O | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. 0.1 | | b. 0.3 | | | | c. 0.6 | | | | | | | | d. 0.5 | | | | | | CO1 | | (1) |
| 23. | Calculate the no of moles in a reaction where 90 grams of HCl are given. | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. 1.34 | | b. 2.47 | | | | c. 5.35 | | | | | | | | d. 6.22 | | | | | | CO1 | | (1) |
| 24. | 4NH3 + 5O2 ------ 6H2O + 4 NO  How many NO is produced if 2.5 moles of O2 are used. | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. 6 mole | | b. 3 mole | | | | c. 5 mole | | | | | | | | d. 8 mole | | | | | | CO1 | | (1) |
| 25. | N2 +3H2= 2NH3, if in the feed mixture 20 moles of N2 is going to react with 80 moles of H2, then which is the limiting reactant. | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. NH2 | | b. N2 | | | | c. H2 | | | | | | | | d. None of them | | | | | | CO1 | | (1) |
| 26. | A Process where production is continues with time is called as | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. Batch Process | | b. Continuous process | | | | | | | | c. Semi Batch | | | | d. Fed-Batch Process | | | | | | CO1 | | (1) |
| 27. | Suppose in a flow reactor water is flowing at 100 kg/min at the inlet to a tank and leaves at the flow rate of 90kg/min. What will be the accumulation after 15 min of operation. | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. 100 | | b. 150 | | | | c. 200 | | | | | | | | d. 250 | | | | | | CO2 | | (1) |
| 28. | Choose the correct equation for the % Recovery | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. I – O / I \* 100 | | b. I + O / I \* 100 | | | | c. I – O / O \* 100 | | | | | | | | d. O – I / O \* 100 | | | | | | CO2 | | (1) |
| 29. | ………… process is often used as a final production step before selling or packaging products | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. Evaporation | | b. Drying | | | | c. Filtration | | | | | | | | d. None of the above | | | | | | CO2 | | (1) |
| 30. | How many moles of H2O are produced if 0.17 moles of O2 are used.  CH4 + 2O2  CO2+2H2O | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. 0.22 | | b. 0.17 | | | | c. 0.33 | | | | | | | | d. 0.65 | | | | | | CO2 | | (1) |
| 31. | When reactants are present in least stoichiometries properties, they are called | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. Excess reactant | | b. Limiting reactant | | | | | | c. Minor reactant | | | | | | d. None of them | | | | | | CO1 | | (1) |
| 32. | When reactants are present in excess of their stoichiometry coefficients, they are called | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. Limiting reactant | | | b. Excess reactant | | | | c. Major reactant | | | | | | | d. None of them | | | | | | CO1 | | (1) |
| 33. | 3 FeS2 +11 O2 = 2Fe2 O4 + 8 SO2, the coefficients of the equation is | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. Absolute coefficients | | b. Stoichiomatatric Coefficients | | | | c. Heat coefficients | | | | | | | | d. Mass transfer coefficients | | | | | | CO1 | | (1) |
| 34. | Any chemical equation provides the information about | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. Reactants | b. Reactants with their quantity | | | | | | | | | | c. Only about quantity | | | | | d. None of them | | | | CO1 | | (1) |
| 35. | A condition of fluid flow in which the volumetric flow rates changes with temperature, pressure, or composition is called as | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. Steady state flow | | b. Unsteady state flow | | | | | | | | | | c. Continuous flow | | | | | d. Laminar flow | | | CO2 | | (1) |
| 36. | The process where there is no addition of input throughout the processing time is  called | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. Fed-Batch Process | | b. Batch Process | | | | c. Semi Batch | | | | | | | | d. Continuous Process | | | | | | CO2 | | (1) |
| 37. | Example of tie element is | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. Activated carbon | | | | b. Ash | | c. Charcoal | | | | | | | | d. Coal | | | | | | CO2 | | (1) |
| 38. | Major Material Balance is classified into two types | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. With chemical reactions | | b. With and Without chemical reactions | | | | | | | | | | | c. Without chemical reactions | | | | | d. None of them | | CO2 | | (1) |
| 39. | The general equation for material balance is | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. Input - generation – output – consumption = accumulation | | b. Input + generation – output – consumption = accumulation | | | | c. Input + generation + output – consumption = accumulation | | | | | | | | d. Input + generation – output +consumption = accumulation | | | | | | CO2 | | (1) |
| 40. | Molecular Weight of CH3OH is \_\_\_\_\_\_\_\_\_\_\_ | | | | | | | | | | | | | | | | | | | |  | |  |
|  | a. 28 | | b. 32 | | | | c. 42 | | | | | | | | d. 40 | | | | | | CO2 | | (1) |
| **PART B(8 X 5 = 40 MARKS) (ANSWER ANY EIGHT)** | | | | | | | | | | | | | | | | | | | | | | | | |
| 41. | In a double effect evaporator plant the second effect is maintained under vacuum of 475 Torr. Find the absolute pressure in kPa, bar and psi. | | | | | | | | | | | | | | | | | | | CO1 | | (5) | | |
| 42. | Calculate the mass flow rate of a given fluid whose density is 785 kg/m3, velocity and area of cross section are 10 m/s and 15 cm2 respectively. | | | | | | | | | | | | | | | | | | | CO1 | | (5) | | |
| 43. | A sample of gas having volume of 0.5 m3 is compressed in such a manner so that pressure is increased by 60%. The operation is done for final mass of gas at constant temperature. Calculate the volume of gas. | | | | | | | | | | | | | | | | | | | CO1 | | (5) | | |
| 44. | Determine the molality and molarity of solution prepared by dissolving 75 gm Ba(NO3)2 into 374 gm of H2O at 25 C. (water density = 0.99707 g/ml3) | | | | | | | | | | | | | | | | | | | CO2 | | (5) | | |
| 45. | How many grams of NO are produced if 20 gm NH3 is burned in 30 gm O2?  4NH3+5O2 -----˃ 6H20 +4NO | | | | | | | | | | | | | | | | | | | CO2 | | (5) | | |
| 46. | In textile mill, double effect evaporator systems concentrate weak liquor containing 4% caustic soda to produce lye containing 25% solids. Calculate the evaporation of water per 100 kg feed in the evaporator. | | | | | | | | | | | | | | | | | | | CO2 | | (5) | | |
| 47. | Write short note on Rotary drum drier and Spray drier. | | | | | | | | | | | | | | | | | | | CO2 | | (5) | | |
| 48. | Explain the concept of single effect and multi effect evaporator with diagram and mass balance equations. | | | | | | | | | | | | | | | | | | | CO2 | | (5) | | |
| 49. | Explain the concept of filtration process with scientific diagram and with proper equations. | | | | | | | | | | | | | | | | | | | CO2 | | (5) | | |
| 50. | Explain the mechanism of Drying Process with its application and diagram. | | | | | | | | | | | | | | | | | | | CO2 | | (5) | | |
|  |  | | | | | | | | | | | | | | | | | | |  | |  | | |
| **PART C( 2 X 10 = 20 MARKS) (ANSWER ANY TWO)** | | | | | | | | | | | | | | | | | | | | | | | | |
| 51. | A gas mixture contains 0.274 k mol of HCl, 0.337 k mol of N2 and 0.089 k mol of O2. Calculate   1. Average molecular weight of gas 2. Volume occupied by the mixture at 405.3 k pa and 30 C. 3. Partial pressure of each compound. | | | | | | | | | | | | | | | | | | | CO1 | | (10) | | |
| 52. | An aqueous solution of NaCl is prepared by dissolving 25 kg of NaCl in 100 kg of H2O. Determine   1. Weight percent 2. Mole percent composition of solution | | | | | | | | | | | | | | | | | | | CO1 | | (10) | | |
| 53. | 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 | | (10) | | |

**………………..…..…………………………BEST OF LUCK………..………………………………………**