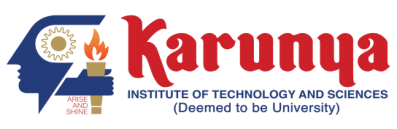
Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_

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

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| **Code :** | **14FP2001** | **Duration :** | **3hrs** |
| **Sub. Name :** | **PRINCIPLES OF FOOD PROCESS 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. | a. | Make the following conversion;  i. 294 g/L of H2SO4 to normality (N)  ii. 4.8 mg/ml CaCl2 to normality (N)  iii. 5 N H3PO4 to g/L  iv. 54.75 g/L HCl to molarity (M)  v. 3 M K2SO4 to g/L. | CO2 | 20 |
| **(OR)** | | | | |
| 2. | a. | The flow rate of water through a pipe is reported as 15 ft3/min. Taking the density of water 1 g/cc, calculate the mass flow rate in kg/s. | CO2 | 6 |
| b. | Show that the expression for kinetic energy and potential energy are dimensionally consistent. | CO1 | 8 |
| c. | The available nitrogen nitrogen in a urea sample is found to be 45% (by mass). Find the actual urea content in the sample (NH2CONH2). | CO2 | 6 |
|  |  |  |  |  |
| 3. | a. | A cylinder of 120 lit capacity contains CO2 at 100 bar and at 20°C. Determine i. mass of the gas ii molar volume iii. density of the gas and iv. specific volume. | CO2 | 8 |
| b. | State Avagadro’s law for both MKS and FPS system. | CO1 | 4 |
| c. | What is equation of state for gaseous system? Explain Vander Waals equation for real gases. | CO1 | 8 |
| **(OR)** | | | | |
| 4. |  | 1000 m3 of a mixture of H2, N2 and CO2 at 150°C was found to have the following ratio of the partial pressures of the gases:  PH2 : PN2 : PCO2 = 1 : 4 : 3, if the total pressure is 2 atm, absolute, find  i. Mole fraction of each of these gases   1. Weight percent of these gases 2. Average molecular weight 3. Weight of CO2 in kilograms | CO2 | 20 |
|  |  |  |  |  |
| 5. | a. | The following enthalpy changes are known from experiment for the reactions below, at 25°C in standard state. Calculate the standard heat of formation of propylene gas.  Reactions ∆H° kcal/g mole   1. C3H6 (g) + H2 (g) --------C3H8 (g) -29.60 2. C3H8 (g) + 5O2 (g) ------ 3CO2 (g) +4 H2O (l) -530.60 3. H2 (g) + ½ O2 (g) -------- H2O (l) -68.30 4. C (graphite) + O2 (g) ----------- CO2 (g) -94.05 | CO2 | 12 |
| b. | Calculate the energy required in kcal to heat 1 kg mole of hydrogen from 20°C to 140°C  CpH2 = 6.946 – 0.196x10-3T + 0.4757x10-6T2 kcal/kg mole K where T is in Kelvin | CO2 | 8 |
| **(OR)** | | | | |
| 6. | a. | Atmospheric air at 760 mm of Hg has 45°C dry bulb temperature and 30°C wet bulb temperature using psychrometric chart, calculate the following  i. relative humidity ii. humidity ratio,iii. dew point temperature  iv. enthalpyv. specific volume of air. | CO2 | 15 |
| b. | State and explain degree of saturation in air water vapour system. | CO1 | 5 |
|  |  |  |  |  |
| 7. |  | The spent acid from a nitrating process contains 33% H2SO4, 36% HnO3 and 31% water by weight. This acid is to be strengthened by the addition of concentrated sulphuric acid containing 95% H2SO4, and concentrated nitric acid containing 78% HnO3. The strengthened mixed acid is to contain 40% H2SO4 and43% HnO3. Calculate the quantities of spent and concentrated acids that should be mixed together to yield 1500 Kg of the desired mixed acid. | CO2 | 20 |
| **(OR)** | | | | |
| 8. | a. | Calculate the molecular volume of all gases at 250 kN/m2 and at 30°C. | CO2 | 5 |
| b. | Calculate the pressure exerted by 5 moles of CO2 in one litre vessel at 47°C using Vander waal's equation. Also report the pressure of gas if it behaves ideally in nature. Given that a=3.592 atm lit2 mol-2. b = 0.0427 lit mol-1. | CO2 | 15 |
|  | | **Compulsory:** |  |  |
| 9. | a. | For the production of marmalade, the fruits are mixed with sugar and pectin and the mixture is boiled to about 65% solids concentration. Find the amount of fruits, sugar, and pectin that must be used for the production of 1000 kg marmalade, if the solid content of the fruits is 10%, the ratio of sugar to fruit in the recipe is 56:44, and the ratio of sugar to pectin is 100. | CO2 | 14 |
| b. | How much glucose syrup with 20% concentration has to be mixed with 100 kg glucose syrup with 40% concentration so that the mixture will have 36% glucose? | CO2 | 6 |