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 – April/May– 2017**

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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. | Show that the Reynold’s no is a dimensionless quantity. The formula for Reynolds No is NRe = DρU/µ, where U is the velocity, D dia of pipe,µ viscosity and ρ density. | CO2 | 7 |
| b. | Find the total head and total energy per kg of the flowing liquid at a section of a pipe carrying oil of specific gravity 0.8. The pipe diameter is 0.35m. Discharge 200 lps pressure at the section is 100 kN/m2. The section is 3.5 m above the datum. | CO2 | 7 |
| c. | Define molality and molarity and normality. | CO1 | 6 |
| (OR) | | | | |
| 2. | a. | What are minor and major losses explain. | CO1 | 6 |
| b. | Derive the expression for minor loss due to sudden expansion for the fluid flowing through a pipe. | CO1 | 14 |
| 3. | a. | Milk is flowing through a full pipe whose diameter is known to be 1.8 cm. The only measure available is a tank calibrated in cubic feet and it is found that it takes 1 h to fill 12.4 ft3. What is the velocity of the liquid in the pipe? | CO2 | 8 |
| b. | A solution of potassium hydroxide (KOH) in water contains 250gm of KOH per liter of solution a 27°C. The densities of solution and of water at 27°C are 1.2 and 1.0gm/cc respectively. Calculate  i. Composition in weight percent.  ii. Composition in volume percent. | CO2 | 12 |
| (OR) | | | | |
| 4. | a. | What is equation of state? Explain Vander Waal’s equation of state for real gases. | CO1 | 15 |
| b. | Define standard heat of formation of a compound from its element. | CO1 | 5 |
| 5. | a. | It is required to make 1000 kg mixed acid containing 60% H2SO4, 32% HNO3 and 8% water by blending i) the spent acid containing 11.3% HNO3, 44.4% H2SO4 and 44.3% H2O ii) aqueous 90% HNO3 and iii) aqueous 98% H2SO4. All percentages are by mass. Calculate the quantities of the three acids required for blending. | CO2 | 15 |
| b. | What are the mothods of solving material balance problems without chemical reactions? | CO1 | 5 |
| (OR) | | | | |
| 6. | a. | On the basis of the data and the chemical reactions given below, find the heat of formation of ZnSO4 from elements.  i) Zn + S (rhomb) ----------- ZnS ΔH = -44 kcal/Kg mol.  ii) 2ZnS + 3O2------------ 2ZnO + 2SO2 ΔH = -221.88 kcal/kg mole  iii) 2SO2 + O2 ------------ 2SO3 ΔH = - 46.88 Kcal/kg mole  iv) ZnO + SO3 ------------ ZnSO4ΔH = - 55.10 Kcal/kg mole | CO2 | 15 |
| 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 + 0.4757x10-6T2kcal/kg mole K where T is in Kelvin | CO2 | 5 |
| 7. | a. | A gas mixture has the following composition by volume.  Ethylene 30.6%  Benzene 24.5%  Oxygen 1.3%  Methane 15.5%  Ethane 25.0%  Nitrogen 3.1%  Find a) the average molecular mass of the gas mixture, b) the composition by mass and c) the density of the mixture in Kg/m3 at NTP. | CO2 | 15 |
| b. | What is pressure correction factor and volume correction factor in Vander Waal’s equation? | CO1 | 5 |
| (OR) | | | | |
| 8. | a. | How many kg/h of sugar syrup with 10% sugar must be fed to an evaporator to produce 10,000 kg/h of sugar syrup with 65% sugar? | CO2 | 8 |
| b. | Find the ratio of milk with 3.8% fat to milk with 0.5% fat that have to be mixed in order to produce a blend with 3.5% fat. | CO2 | 7 |
| c. | What is an ideal solution and how to find out the enthalpy of the ideal solution? | CO2 | 5 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Derive the expression formajorhead loss dueto pipe friction using Darcy’equation. | CO1 | 15 |
| b. | A mass of 100g each of HNO3 and H2SO4 is filled in two separate bottles. Which bottle contains more molecules? How many more? (N – 14, S -32). | CO2 | 5 |

ALL THE BEST