Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

THIRD SEMESTER B.TECH DEGREE EXAMINATION (Regular), DECEMBER 2022
FOOD TECHNOLOGY
(2020 SCHEME)

Course Code: **20FTT201**

Course Name: **Principles of Chemical Engineering**

Max. Marks: **100** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Fructose, $C_6H_{12}O_6$, is a sugar found in honey and fruits. The sweetest sugar, it is nearly twice as sweet as sucrose. How much water should be added to 1.75g of fructose to give a 0.125m solution of Fructose?
2. Milk is flowing through a pipe whose diameter is known to be 1.8cm. The only measure available is a tank calibrated in ft^3 and it is found that it takes 1 Hr to fill 12.4 ft^3. What is the velocity of the liquid in the pipe?
3. Explain the terms
   i. Limiting reactant
   ii. Excess Reactant
   iii. Yield
4. Define heat of reaction and its types?
5. State Newton's Law of Viscosity
6. Calculate the specific weight, density and specific gravity of two liters of a liquid which weight 15N
7. Interpret the Bernoulli's equation for real fluid.
8. Interpret the Darcy Weishback equation.
9. Explain different types of pumps.
10. Depict the working principle of Orifice meter.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. A binary mixture consists of 35% benzene and 65% toluene are continuously fed to the distillation column at a rate of 1000kg/hr. Whereas, the distillate flow rate was 10% from the feed flow rate. The distillate (top product) contains 85% benzene. Calculate quantity and compositions of the waste stream. (14)

OR

12. a) In the processing of fish, after oil is extracted, the fish cake is dried in rotary drum drier, finely ground and packed. The resulting product contains 65% of protein, in a given batch of fish cake that contains 80% water (remaining is dry cake). 100kg of water is removed and is found that the fish cake is then 40% water. Calculate the weight of fish cake originally put into drier. (8)

b) How much glucose syrup with 20% concentration has to be mixed with 100kg glucose syrup with 40% concentration so that the mixture will have 36% glucose? (6)

MODULE II

13. a) The CO is reacted with H_2 to Produce CH_3OH (Methanol).

Calculate:

i. Stoichiometry ratio of H_2 & CO (7)

ii. KgMol of CH_3OH produced per 50 KgMol of CO reactant

iii. Weight ratio of CO & H_2 (Fed in stoichiometric proportion)

Use of the Chemical Equation to Calculate the Mass of Reactants Given the mass of Products:

$$C_7H_{16} + 11O_2 \longrightarrow 7CO_2 + 8H_2O$$

b) In the combustion of heptane, CO_2 is produced. Assume that you want to produce 500kg of dry ice per hour, and that 50% of the CO_2 can be converted into dry ice, how many kilograms of heptane must be burned per hour? (7)

OR

14. a) 1000 kg/h of milk is heated in a heat exchanger from 45°C to 72°C. Water is used as the heating medium. It enters the heat exchanger at 90°C and leaves at 75°C. Calculate the mass flow rate of the heating medium, if the heat losses to the environment are equal to 1 kW. The heat capacity of water is given equal to 4.2 kJ/kg°C and that of milk 3.9 kJ/kg°C. (8)

b) How much saturated steam with 120.8 kPa pressure is required to heat 1000 g/h of juice from 5°C to 95°C? Assume that the heat capacity of the juice is 4 kJ/kg°C. (6)

MODULE III

15. Derive the calculation of pressure of different types of simple and differential manometer with neat sketch. (14)

OR

16. Explain the physical properties of fluids and type of fluids with examples. (14)

MODULE IV

17. Starting from Euler's equation of motion derive Bernoulli's and list out relevant assumption. (14)

OR

18. Derive Hagen Poiseuille equation for steady laminar flow of Newtonian fluid in a uniform cylindrical tube. (14)

MODULE V

19. Explain the various types of pumps with near sketch and their applications. (14)

OR

20. Outline the co-efficient of discharge of a orifice meter. (14)

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