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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

THIRD SEMESTER B.TECH DEGREE EXAMINATION (S), MAY 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. How many kg/hr of sugar syrup with 10% sugar must be feed to an evaporator to produce 10000kg.hr of sugar syrup with 65% sugar.
3. Explain the terms
   a) Limiting reactant
   b) Excess Reactant
   c) Yield
4. How much saturated steam with 120.8 kPa pressure is required to concentrate 1000 kg/h of juice from 12% to 20% solids at 95°C? Assume that the heat capacity of juice is 4 kJ/kg°C.
5. Recall 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. Define efficiency of centrifugal pump.
10. Depict the working principle of rotameter.

PART B

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

MODULE I

11. A binary mixture consists of 25% benzene and 85% toluene are continuously fed to the distillation column at a rate of 2500kg/hr. Whereas, the distillate flow rate was 20% from the feed flow rate. The distillate (top product) contains 75% benzene. Calculate quantity and compositions of the waste stream. (14)

OR

12. a) You are asked to prepare a batch of 18.63% battery acid as follows. A tank of old weak battery acid (H_2SO_4) solution contains 12.43% H_2SO_4 (the (8)

remainder is pure water). If 200 kg of 77.7% H_2SO_4 is added to the tank, and the final solution is to be 18.63% H_2SO_4, how many kilograms of battery acid have been made?

b) It is required to prepare 1250kg of a solution composed of 12 wt% ethanol and 88 wt% water. Two solutions are available, the first contains 5 wt% ethanol, and second contains 25 wt% ethanol. How much of each solution are mixed to prepare the desired solution? (6)

MODULE II

13. A limestone analyses (weight%) (14)

$CaCO_3$ 92.89%

$MgCO_3$ 5.41%

Inert 1.70%

By heating the limestone, you recover oxides known as lime.

(a)How many pounds of calcium oxide can be made from 3 ton of this limestone?

(b)How many pounds of CO_2 can be recovered per pound of limestone?

(c)How many pounds of limestone are needed to make 1 ton of lime?

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. a) Differentiate between the simple manometer and differential manometer with neat sketch. (8)

b) A differential manometer is connected a two-point A and B of two pipes as shown in fig. The pipe A contain a liquid of sp.gr. = 1.5 While pipe B contains a liquid Sp.gr = 0.9. The pressure A and B are 1 Kgf/cm^2 and 1.80 Kgs/cm^2 respectively. Find the difference in mercury level in differential manometer (6)

OR

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

MODULE IV

17. Derive Bernoulli's equation from Euler's equation of motion (or) state and explain Bernoulli's equation with assumptions. (14)

OR

18. a) The water is flowing through a taper pipe of length 100 m and having (8)

diameter 600 mm at the upper end and 300 mm at the lower end, at the rate of 50 litres per second the pipe has slope of 1 in 30. Find the pressure at lower end. If the pressure at the higher level is 19.62N/cm^2.

b) At a sudden enlargement of a water main from 240 mm to 480 mm diameter hydraulic gradient rises by 10 mm. Find the rate of flow. (6)

MODULE V

19. With neat sketches explain the working of a single acting and double acting positive displacement pumps. (14)

OR

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

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