Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

MAKE-UP EXAMINATION- JAN 2023

Course Code: PET 316

Course Name: Fundamentals of Process Engineering Calculations

Program: B. Tech (PET)

Date: 24-Jan-2023

Time: 01:00 AM to 4:00 PM

Max Marks: 100

Weightage: 50%

Instructions:

(i) Read the all questions carefully and answer accordingly.

(ii) All questions are mandatory

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries TWO marks. (10Qx 2M= 20M)

1. Define the terms extraction and absorption (C.O.No.1) [Knowledge]

2. Define Raoult's Law (C.O.No.2) [Knowledge]

3. What is the relation between partial pressure and total pressure? (C.O.No.2)[Knowledge]

4. What do you understand by Mole per cent? (C.O.No.3) [Knowledge]

5. In a simple distillation column, how many outlets are there and what is there name? (C.O.No.2) [Knowledge]

6. What do you mean by HCV and LCV? (C.O.No.3) [Knowledge]

7. Define Amagat's Law with proper equation (C.O.No.2) [Knowledge]

8. Define the term saturated humidity (C.O.No.4) [Knowledge]

9. Why do we use solvent in absorption process? (C.O.No.4) [Knowledge]

10. Which component in absorption process does not take part in the reaction? (C.O.No.4) [Knowledge]

Part B [Thought Provoking Questions]

Answer the Questions. Question carries TEN marks. (4Qx10M= 40M)

11. For a chemical reaction 6N of H_2SO_4 was prepared. Now for a particular reaction the concentration of H_2SO_4 is to be expressed in terms of g/l from 6N. Convert the concentration in the required units so the desired reaction maybe carried out. [A.wt S=32] (C.O.No.1) [Application]

12. A gas mixture contains 28% of CO_2 as solute and 72% of Argon as Inert Gas is fed to an absorption tower, which it is contacted with monoethanolamine (MEA) which is used as a solvent which absorbs $C0_2$. The molar flow rate of solvent flowing in the absorption tower is 450 kgmol/hr. The lean gas leaving the tower contains $C0_2$=7.5%, monoethanolamine =5.5 % and rest is Argon gas. Evaluate and find the percentage recovery of solute CO_2.

$Na_2CO_3 = Na_2O + CO_2$ (C.O.No.2) [Application]

13. Conditioned air at 760 mmHg total pressure, 80°C and at a humidity of 0.06 kg water per kg of bone dry air enters the drier. It leaves the drier at 760 mmHg total pressure and 80°C, with RH 81%. Vapour pressure of water at 50°C is 91.5 mmHg. If 75 kg of water enters into the air stream per hour, calculate the rate of bone dry air flowing through the dryer. (C.O.No.3) [Application]

14 A diluted acid was prepared for a chemical reaction. The strength of Sulphurous acid (H_2SO_3) sample is found to be 30% $S0_2$ by weight. Find out the actual concentration of H_2SO_3 (Weight %) in the acid. The chemical reaction is given below. [A.wt S=32]

$H_2SO_3 \rightarrow SO_2 + H_2O$ (C.O.No.4) [Application]

Part C [Problem Solving Questions]

Answer both Questions. Question carries TWENTY marks. (2Qx20M=40M)

15. 8,000 kg/h of solution containing 30% methanol is continuously fed to a distillation column. Distillate is found to contain 94% methanol and waste solution from the column carries 3% methanol. All percentage are by weight. Estimate the flowing

(i) The mass flow rates of distillate and bottom product

(ii) The percentage loss of methyl alcohol? (C.O.No.3) [Application]

16. A solution contains only methanol and xylene.100 kg mol/hr of 45 % mole of solution of methanol and rest xylene is fed to the middle of the distillation column as feed. The distillate contains 65 mole% of methanol rest xylene and the bottom consist of 85 mole% xylene rest methanol.What is the flow rate of each stream? (C.O.No.4) [Application]