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**SARDAR PATEL UNIVERSITY**  
**EXTERNAL EXAMINATION, NOVEMBER 2015**  
**M.Sc. INDUSTRIAL CHEMISTRY-SEM 1**  
**MASS TRANSFER OPERATIONS - PS01CICH09**

5<sup>th</sup> April, 2016  
Time: 10.30 a.m - 1.30 p.m

Max. Marks: 70

Answer all the questions.

Figures to the right side indicate marks

**Q1. Write the number of the correct answer. ( each question carries one mark) (08)**

- a. Desirable value of absorption factor in an absorber is ----**  
i.  $>1$       ii.  $<1$       iii. 1      iv. 0.5
- b. Corners of the equilateral triangle in solubility curve represent**  
i. A pure component      iii. A ternary mixture  
ii. A binary mixture      iv. A partially miscible ternary mixture
- c. Relative volatility does not change appreciably with respect to**  
i. temperature      ii. vapour pressure      iii. total pressure      iv. None of these
- d. Heat sensitive materials are dried using-----**  
i. Freeze drier      ii. Spray Drier      iii. tray drier      iv. Rotary drier
- e. Raoult's law is applicable to**  
i. Ideal solutions      ii. Real solutions      iii. Mixture of water & alcohol      iv. Non-ideal gases
- f. Flooding in an absorber results in**  
i. Low tray efficiency      iii. high tray efficiency  
ii. High gas velocity      iv. good contact between fluids
- g. Liquid extraction systems with viscous components are better separated using**  
i. Packed columns      ii. Counter current Mixer-settler cascades  
iii. Rotary Disc Contactor      iv. Sieve plate column
- h. The transition from constant drying rate to falling drying rate is represented by**  
i. free moisture content      iii. critical moisture content  
ii. bound moisture content      iv. unbound moisture content

**Q2. Answer any seven (each question carries two marks) (14)**

- a. Why is Ponchon-Savarit method considered to be better over McCabe-Thiele method for distillation calculations?
- b. What are filter aids?
- c. Distinguish between through & cross circulation drying
- d. Define flooding in distillation columns
- e. Define hold up in driers. What are the variables affecting hold up?
- f. Define Reynolds number. What is its application?
- g. Distinguish between liquid absorption & distillation
- h. Enlist the variables affecting hold up in rotary driers
- i. Why is the boiling point of the solvent to be considered in the selection of solvent for liquid extraction?

**Q3.**

- a. Explain the principle of differential and flash distillation. (06)
- b. Explain the various factors affecting plate efficiency in a plate distillation column (06)

**OR**

- b. Explain the use of enthalpy-composition diagram for adiabatic and non-adiabatic mixing (06)

**Q4.**

- a. Write a note on HETP and absorption accompanied by chemical reaction (06)
- b. Explain liquid phase mass transfer in packed towers (06)

**OR**

- b. Discuss pressure drop through packed towers (06)

**Q5.**

- a. Compare Rayleighs and Buckingham  $\pi$  methods used in dimensional Analysis (06)
- b. With the help of a neat diagram, explain the functioning of Rotocel extractor (06)

**OR**

- b. With the help of a neat diagram, explain the functioning of pulse column extractor (06)

**Q6.**

- a. Discuss the effect of shrinkage of solid in controlling drying rate (06)
- b. A 100 kg batch of granular solids containing 30 % moisture is to be dried in a tray drier to 16 % moisture using air at 350 K and flowing at 1.8 m/s. If the constant rate of drying is  $0.7 \times 10^{-3}$  kg/m<sup>2</sup>s and the critical moisture content is 15 %, calculate the drying time. The drying surface is 0.03 m<sup>2</sup>/kg dry weight (06)

**OR**

- b. With the help of a neat diagram, explain the working of a semi continuous centrifuge (06)

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