



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 162402

Roll No.

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B. Tech.

(SEM. IV) THEORY EXAMINATION, 2014-15

PRINCIPLE OF CHEMICAL ENGINEERING

Time : 3 Hours]

[Total Marks : 70

Note: (1) Attempt ALL questions

(2) Be precise in your answer

(3) Assume suitable data, if required

1 Attempt **any two** parts of the following:- **7x2=14**

- (a) Define net positive suction head (NPSH). Explain the Newton's law of viscosity with suitable examples. Also discuss Non-Newtonian fluids with suitable examples.

- (b) Describe the principle and construction of reciprocating pumps with its application in industry.

- (c) Define Rotameters. Differentiate between variable area type and variable head type flow meters. Write their advantages and limitations.

2 Attempt **any two** parts of the following: **7x2=14**

- (a) Define steam economy of an evaporator. Show various methods of feed in a Triple effect evaporator.
- (b) Discuss the different modes of drying operation. With the help of neat sketch, explain the construction and operation of a rotary dryer.
- (c) What is McCabe Thiele Graphical Method used for distillation column? Also derive the expressions for Feed section operating line.

3 Attempt **any TWO** parts of the following: **7x2=14**

The spent acid from a nitrating process contains 33% H_2SO_4 , 36% HNO_3 and 31% water by weight. This acid is to be strengthened by the addition of concentrated sulphuric acid containing 95% H_2SO_4 and concentrated nitric acid containing 90% HNO_3 . The strengthened

mixed acid is to contain 40% H_2SO_4 and 43% HNO_3 . Calculate the quantities of spent and concentrated acids that should be mixed together to yield 1500 kg of the desired mixed acid.

- (a) Discuss the controlling parameters for nucleation and crystal growth rate. Also classify the different types of batch and continuous crystallizer that are used for industries.
- (b) What is equilibrium moisture content? A wet solid is to be dried from 40% to 12% moisture under constant drying conditions in 6 hrs. If the equilibrium moisture content is 5% and critical moisture content is 16%, how long it will take to dry solids to 8% moisture under the same conditions.
- (c) Discuss the characteristics of a solvent used in liquid-liquid extraction process.

4 Attempt **any two** parts of the following: **7x2=14**

- (a) Explain the graphical method to determine number of ideal stages in cross-current absorption cascade.

- (b) A chimney gas has the following composition by volume:

$\text{CO}_2 = 9.5\%$, $\text{CO} = 0.2\%$, $\text{O}_2 = 9.6\%$ and $\text{N}_2 = 80.7\%$

Using the ideal gas law, calculate volume occupied by 1 kg of the gas at 315 K and 750 mm Hg

- (c) Describe the theory of filtration? Explain, Sedimentation, with suitable examples.

5 Attempt any two parts of the following:- $7 \times 2 = 14$

- (a) Enumerate the different parameter, which are responsible for the rate of crystal growth. Also describe the crystallization apparatus.
- (b) Discuss the theory of gas absorption. Also describe any one of the absorption equipments with the help of suitable example.
- (c) Discuss paddle stirrers. Also write short note on kneading machine.