Code No: R05010803 **Set No. 1**

I B.Tech Supplimentary Examinations, Aug/Sep 2008
INTRODUCTION TO CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Describe the Chemical Engineering applications for the essential needs of mankind?
   (b) Define unit operations in a chemical process. [12+4]

2. (a) Write the energy balance equation for the following:
      i. Non-flow process
      ii. Non-flow process at constant volume
      iii. Non-flow process at constant pressure
      iv. Flow system.
   (b) Give the steps to be followed in making energy balance calculations. [8+8]

3. The total energy content of a fluid element in motion has several components. Discuss in detail and obtain the total energy balance for steady flow. [16]

4. Derive the expression for log mean temperature difference for parallel flow heat exchanger. What are the conditions under which it is valid? [16]

5. (a) What are absorption and desorption processes? Explain with suitable examples.
   (b) Absorption and desorption processes may be handled in two ways. What are they? Explain.
   (c) Describe the essential features and operation of packed absorption column and mention the three main steps in its design. [4+4+8]

6. (a) What is distillation? Explain briefly.
   (b) Describe flash distillation with a neat diagram. By making a material balance for the more volatile compound in a binary mixture, obtain an expression for the fraction of feed vaporized.
   (c) Explain how the composition of the vapor and liquid leaving the separator can be calculated in part (b). [4+8+4]

7. (a) Write briefly about the selection of equipment for gas-liquid operations.
   (b) Write briefly about the selection of solvent in liquid-liquid extraction. [10+6]

8. (a) Define drying. How is it different from evaporation, dehydration, freeze- drying and gas drying?

(b) Explain how heat and mass transfer occur simultaneously during drying. Mention the uses of drying operation. [10+6]

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Code No: R05010803 **Set No. 2**

I B.Tech Supplimentary Examinations, Aug/Sep 2008
INTRODUCTION TO CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the electromechanical operations.
   (b) Write on the three modes of heat transfer with examples. [8+8]
2. (a) Describe the heat of reaction at constant pressure and at constant volume.
   (b) Explain Hess's law of heat summation. [8+8]
3. (a) What is priming? How can it be overcome?
   (b) Give a detailed account of centrifugal pumps. [8+8]
4. (a) Explain heat conduction through a composite plane wall with a neat figure. Also, derive the equation for the rate of heat transfer.
   (b) The mean area for heat transfer depends on the shape of the solid. State the different ways in which it can be expressed for different shapes of solids. [10+6]
5. (a) Explain overall mass transfer coefficient in terms of film coefficients.
   (b) Discuss about the flux equations for diffusion in gases and diffusion in liquids. [8+8]
6. (a) What is simple batch distillation? Explain with a neat diagram.
   (b) Derive the Rayleigh equation for simple batch distillation and explain the terms involved.
   (c) Obtain the expression for the average composition of the total material distilled by making a material balance for simple batch distillation.
   (d) Differentiate between distillation and absorption. [6+6+2+2]
7. (a) What are the two main categories into which industrial liquid-liquid contactors are classified? Discuss about each category.
   (b) Describe the construction and working of a rotating disc contactor. Where is it used and what are its advantages? [6+10]
8. (a) Define drying. How is it different from evaporation, dehydration, freeze- drying and gas drying?
   (b) Explain how heat and mass transfer occur simultaneously during drying. Mention the uses of drying operation. [10+6]

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Code No: R05010803 **Set No. 3**

I B.Tech Supplimentary Examinations, Aug/Sep 2008
INTRODUCTION TO CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Discuss briefly about the following mechanical operations:
   (a) Settling and Sedimentation
   (b) Screening. [8+8]
2. (a) When is a gas said to be saturated and partially saturated with vapor? When does condensation of vapor take place?
   (b) Define the following in words and write the formulae:
      i. Relative saturation
      ii. Percentage saturation.
   (c) Obtain a relation between percentage saturation and relative saturation, assuming the gas mixture behaves ideally. When are both equal? [3+4+4+5]
3. (a) Explain shear stress versus shear rate plot for different fluids.
   (b) Define stream line and a stream tube. [12+4]
4. Write short notes on:
   (a) Extended surface exchangers
   (b) Scraped surface heat exchangers
   (c) Spiral plate exchangers. [16]
5. (a) Name two mass transfer operations for the following phases in contact:
      i. liquid-liquid
      ii. solid-vapor.
   (b) Mention the similarities between various mass transfer operations.
   (c) Many differences exist between various mass transfer operations. Explain with examples. [8+4+4]
6. (a) Write about azeotropic distillation and extractive distillation.
   (b) Discuss the principles of simple batch distillation. [8+8]
7. (a) Discuss about the term distribution coefficient with respect to liquid-liquid extraction. Explain with reference to dilute solutions and concentrated solutions.

(b) What are the various considerations in the selection of the phase to be dispersed.

(c) Write about the classification of industrial liquid-liquid contactors. Discuss about each category. [6+4+6]

8. (a) Distinguish between physical and chemical adsorption.

(b) Define and explain the process of adsorption. [8+8]

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Code No: R05010803 **Set No. 4**

I B.Tech Supplimentary Examinations, Aug/Sep 2008
INTRODUCTION TO CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain the following:
   (a) Average molecular weight of a gas mixture
   (b) Mass fraction of components in a mixture
   (c) Mole fraction and density of a gas mixture
   (d) Define vapour pressure and state Henry's law. [4+4+4+4]
2. (a) When is a gas said to be saturated and partially saturated with vapor? When does condensation of vapor take place?
   (b) Define the following in words and write the formulae:
      i. Relative saturation
      ii. Percentage saturation.
   (c) Obtain a relation between percentage saturation and relative saturation, assuming the gas mixture behaves ideally. When are both equal? [3+4+4+5]
3. (a) State and explain the equation of continuity for one dimensional flow.
   (b) Explain total energy balance for steady flow and describe each fluid head. [4+12]
4. (a) Write the equation for rate of heat transfer by conduction at steady state and explain the terms.
   (b) Define thermal conductance and thermal resistance.
   (c) Explain heat conduction through resistances in parallel, with a neat diagram. [4+4+8]
5. (a) Explain overall mass transfer coefficient in terms of film coefficients.
   (b) Discuss about the flux equations for diffusion in gases and diffusion in liquids. [8+8]
6. Discuss in detail the following types of distillation with neat diagrams:
   (a) Equilibrium distillation
   (b) Differential distillation. [8+8]
7. (a) With a neat sketch briefly explain the construction and working principle of packed column and discuss the merits and demerits of the same.

(b) What is meant by " fractional extraction"? [12+4]

8. (a) What do you understand by the following terms pertaining to drying?
   i. Capillary flow
   ii. Internal diffusion
   iii. Funicular state
   iv. Pendular state.

   (b) Describe the construction and operation of rotary dryers with a neat diagram. Mention its uses and advantages. [8+8]

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