



**SCT 314-2 Chemical Engineering Science**

---

No. of questions: Four (04)

Answer all questions

Time allocation: two (02) hours

Total marks allocated: 100 marks

---

1.
  - a. Define the terms 'batch process' and 'continuous process.' Compare the advantages of batch processes and continuous processes. (Marks 10)
  - b. What are the factors to be considered in designing a chemical manufacturing process? (Marks 07)
  - c. Describe the 'contact process' in sulfuric acid manufacturing. (Marks 08)
  
2.
  - a. Write the steps to be followed in modern process development. (Marks 10)
  - b. What are the major hazards encountered in a chemical manufacturing process? (Marks 05)
  - c. Write a short account on safety and loss prevention of a manufacturing process. (Marks 10)
  
3.
  - a. What are common unit processes those engage with heat transfer as the unit operation in food processing? (Marks 07)

- b. Discuss the properties of evaporating liquids those affect the process of evaporation.

(Marks 08)

- c. Briefly describe the use of centrifugation process in

- i. dairy industry
- ii. sugar industry
- iii. natural rubber latex industry

(Marks 10)

4.

- a. In a process of producing ethane from ethanol, first ethanol is fed into a continuous reactor in the presence of sulfuric acid as the catalyst to produce ethylene. Then the resulted mixture of ethylene and water was separated by distillation. The resulting ethylene as the top or overhead product is then condensed using a condenser to produce liquid ethylene. Hydrogenation of liquid ethylene is carried out in another reactor in the presence of Nickel catalyst to produce ethane as the final product. Develop a process flow diagram for this process using the given information.

(Marks 10)

- b. A liquid feed containing 30.0 mole % benzene (B), 25.0 mole % toluene (T), and the balance xylene (X) is fed into a distillation column. The bottom product stream contains 98.0 mole % X and 96.0 % of the X in the feed is recovered in this stream. This stream does not contain B. The overhead product from the first column is fed into a second distillation column. The overhead product stream from the second column contains 97.0 mole % of the B in the feed to this column. This stream contains 94.0 mole % B and the balance is T. Draw the block flow diagram of this process. Calculate the amount of B in the overhead product stream from the second column as a percentage of the amount of B in the feed to the first column. Calculate the amount of T in the bottom product stream from the second column as a percentage of the amount of T in the feed to the first column.

(Marks 15)