

**M.Sc. (Part-II) Semester-III (CBCS) Examination**  
**CHEMISTRY (NEW)**  
**(Industrial Chemistry (Heat Transfer Mass Transfer and Unit Process))**  
**Paper-XI**  
**Special Paper-I**

Time : Three Hours]

[Maximum Marks : 80

**Note :—** All questions are compulsory.

1. (a) State and explain Fourier's law. 5
- (b) Explain the phenomenon of heat transfer by conductance. 5
- (c) Discuss various types of compressors with its industrial applications. 6

**OR**

- (p) State and explain Newton's law. 5
- (q) Explain the construction and working of double pipe heat exchanger. 6
- (r) Derive and explain Bernoulli's equation. 5
2. (a) Explain mixer-settler for extraction with diagram. 5
- (b) What is evaporation ? Describe short tube evaporator in detail. 6
- (c) Discuss construction and working of packed column for Gas absorption. 5

**OR**

- (p) What is extraction ? Give the criterion for selection of solvent. 5
- (q) Describe agitated contactor for gas absorption in detail with diagram. 5
- (r) Explain construction and working of drum dryer. 6
3. (a) Discuss extraction operation with block diagram. Give its material balance equations. 5
- (b) Give an account on :
  - (i) Limiting component.
  - (ii) Excess component. 6
- (c) An evaporator is fed with 15000 kg/hr. of weak feed. Evaporator is expected to concentrate weak feed from 15% to 25% solid by weight. Calculate the capacity of evaporator. 5

**OR**

- (p) Discuss crystallization operation with block diagram. Give the material balance equations. 5
- (q) Give an account on purge operation. 5
- (r) Discuss :
  - (i) Stoichiometric equation.
  - (ii) Stoichiometric coefficient. 6

4. (a) What is nitration ? Explain the mechanism involved in manufacturing of nitrobenzene. 6  
(b) Give an account on aromatic halogenation. 5  
(c) How amination is carried out by reduction using metal and acid ? 5

**OR**

- (p) Explain the manufacturing process of chlorobenzene with flow diagram. 6  
(q) Discuss continuous nitration. 5  
(r) Discuss Bechamp reduction for preparation of amines. 5
5. (a) Discuss various Sulphonating agents used for Sulphonation. 5  
(b) Describe the manufacturing process of acetaldehyde with flow diagram. 6  
(c) What is alkylation ? Explain the manufacturing process of ethylbenzene with flow diagram. 5

**OR**

- (p) Describe the process of Sulphonation of benzene with mechanism. 6  
(q) Give the oxidising agents used for oxidation. 5  
(r) Discuss various factors that affect alkylation reaction. 5