(3 Hours) **Total Marks: 75**

N.B.: **1. Draw diagram whether necessary.**
2. Figures to right indicate full marks.

Q. 1 Attempt all multiple-choice questions (MCQ) **20M**

1 Costs toward Ecological and Environmental effects are counted under
A) Material cost B) Conversion Cost C) waste treatment cost D) Marketing cost

2 A rational approach to scale-up is Dimensional Analysis; some numbers are frequently used to describe the ratios of various physical quantities. Which of the following is a measure of the power required to overcome friction in fluid flow in a stirred reactor
A)Fr, Froud B) Re, Reynolds C) Ne , Newton D) η dynamic viscosity

3 Which of the following concept closely relate with extraction
A)Solubility product B) Vapour pressure
C) Boiling point D) Distribution coefficient

4 Which of the following works based on centrifugal force
A) Plate and frame filter B) Sweetland filter
C)Rotary drum filter D) Chamber filter

5 Which of the following is related to crystallization
A) Mier's theory B) Poiseulles equation
C)Kozeny-Carman equation D) Raoult's law

6 To facilitate azeotropic distillation a component is added to the original feed mixture to form an azeotrope is referred as
A)Molecular sieves B)Entrainer C) Distillation aid D) macerate

7 Biazzi equipment used for industrial synthesis of ……reaction
A)Halogenation B) Sulphonation C) Nitration D) Oxidation

8 Which of the following evaporators gives high heat transfer coefficients
A) Long tube vertical climbing up evaporator B) Agitated-film evaporator
C) Evaporator with forced circulation D) Rising film evaporator

9 Identify the correct formula of DVS
A) S/EN/(R-W) B) S/EN/(R+W) C) S-EN/(R+W) D) S/EN(R+W)

10 When the pH is between 5 to 10, the chlorine in water act as
A) Hypochlorous acid B) Hypochlorite ions
C) Molecular chlorine D) Hypochlorous acid hypochlorite ion

11 Conversion of eugenol to vanillin is type of ……reaction:
A) Oxidation B) Reduction C) Halogenation D) Hydrogenation

12 Hydrogen peroxide used in which of the following name reaction
A)Perkin B) Hoffman C) Dakin D) Clemmensen

13 Penicillin production is optimum in
A) Unique operation system B)Continuous operation system
C) Semicontinuous operation system D) Batch operation system

14 Amino acid proline added into medium to increase yield of production?
A)Streptomycin B) Penicillin C) Lovastatin D) Riboflavin

15 Which of the following is the source of Riboflavin?
A) *A. gossypi* B) *S. griseus* C)*S. tenebrarius* D) *A. purpureus*

16 Optimum pH required for lovastatin production is
A) 3.5 B) 5.5 C) 6.5 D) 8.5

17 SELECT is acronym for
A) Safety, Environmental, Legal, Economics, Control, and Throughput
B) Safety, Economics, Legal, Environment, Control, and Throughput
C) Safety, Environmental, Legal, Economics, Correlate, and Throughput
D) Safety, Environmental, Legal, Economics, Control, and Throughout

18 ISO-14001 standards relates to
A) Environment Management B) Personnel Managemen
C) Occupational , Health and safety management D) Fire and extinguishers

19 BS OHSAS 18001 has been withdrawn in
A) 1995 B) 2000 C) 2010 D) 2021

20 Which of the following is not a secondary treatment in ETP
A) Trickling filtration B) Anaerobic digestion
C) Activated sludge process D) Chemical precipitation

Q 2. Attempt any two of the following

I. Attempt the following **10M**
   a. Explain the theories and principles behind crystallization.
   b. Write a note on theories of distillation and factor affecting it.

II. Attempt the following **10M**
   a. Explain the kinetics of nitration reaction with suitable example
   b. Give a detailed account of catalytic agents used for chlorination.

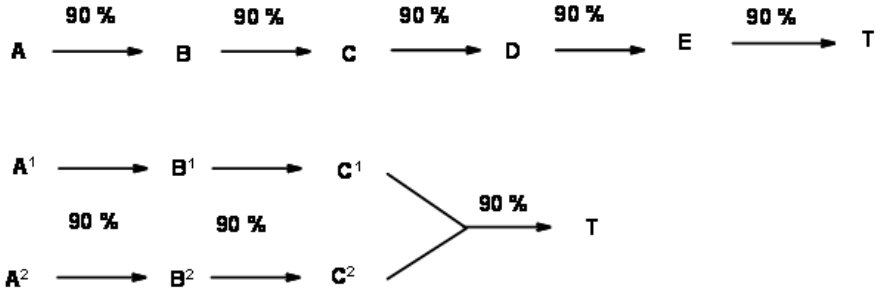
III. Attempt the following **10M**

a. Distinguish between homogeneous and heterogeneous catalyst? Give industrial importance of heterogeneous catalyst.

b. Draw the flow chart of lovastatin downstream process.

Q 3. Attempt any SEVEN of the following questions

I. What are different synthetic strategies? Identify which synthetic scheme is more cost-effective among the following



5M

II. Classify evaporators based on feeding and draw designs of the evaporators depicting material flow. **5M**

III. Discuss the "reaction progress kinetic" including their significance in reaction monitoring for mechanism prediction. **5M**

IV. Discuss production of Penicillin or Streptomycin. **5M**

V. Compare and contrast between continuous and batch processes. **5M**

VI. Explain the construction and working of "Biazzi continuous nitration process" **5M**

VII. Discuss commercial preparation of chloral. **5M**

VIII. Explain the principle behind azeotropic distillation with suitable examples. **5M**

IX. Discuss the design of an effluent treatment plant. **5M**