

MASTER OF TECHNOLOGY (CHEMICAL ENGINEERING) (CBCS - 2015 COURSE)
M. Tech. (Chemical Engineering) Sem-II :SUMMER- 2022
SUBJECT : ADVANCED MASS TRANSFER

Day : Wednesday

Time : 10:00 AM-01:00 PM

Date : 3/8/2022

S-14182-2022

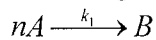
Max. Marks : 60

N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate **FULL** marks.
- 3) Answers to both the section should be written in **SEPARATE** answer book.
- 4) Assume suitable data, if necessary.

SECTION - I

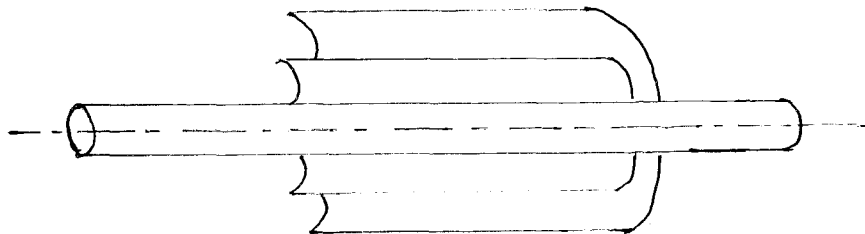
- Q.1** Consider the system in which gas A diffuses through a stagnant gas film to the surface of a nonporous spherical catalyst particle, where it reacts irreversibly according to the expression : **(10)**



Derive an expression for molar flux of A if the reaction on the surface of catalyst particle is slow.

OR

Gas A diffuses through a stagnant gas film to the surface of a nonporous cylindrical catalyst, where it undergoes the reaction $2A \xrightarrow{k_1} B$. Gas B then diffuses from the catalyst and is swept away. Neglecting the diffusion and reaction on the ends of the particle, derive an expression for molar flux of A if the reaction is very fast.



- Q.2** What are the main principles of electrophoresis? Describe the meaning of bands after electrophoresis. **(10)**

OR

What are the commercial applications of electrophoresis and di-electrophoresis? Explain it in detail.

- Q.3** Experiments on de-colourization of oil yielded the following relation: **(10)**

$$Y = 0.004 X^2$$

Where Y = gm colour / gm colour free oil

X = gm colour / gm adsorbent

100 Kg oil containing 1 part of colour to 3 parts of oil is agitated with 25 Kg of the adsorbent. Calculate the % of colour removed if 12.5 Kg adsorbent is used initially, followed by another 12.5 Kg of adsorbent.

OR

Draw a schematic flow sheet and operating diagram for a typical operation of continuous countercurrent multistage adsorption operation. Also state the material balance equations and application of the Freundlich isotherm.

P.T.O.

SECTION – II

Q.4 What is Petlyuk distillation column? Describe with a neat sketch. Also state its advantages over conventional distillation column. (10)

OR

Explain the tray by tray calculations of multicomponent distillation by using Thiele-Geddes method. State clearly the assumptions made.

Q.5 Describe the types of membranes that can be applied for separation of gases. Also explain the complete mixing model for gas permeation membranes. (10)

OR

Classify the membrane separation processes. What is the effect of processing variables on gas separation by membranes?

Q.6 What is zone melting? Explain it in detail and state its applications. (10)

OR

What is supercritical fluid extraction? How it is beneficial over conventional extraction operation?

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