M. TECH. –II (CHEMICAL ENGINEERING) (CBCS – 2015 COURSE) : SUMMER - 2018

SUBJECT – ADVANCED MASS TRANSFER

Day : **Monday**
Date : **18/06/2018**

S-2018-3022

Time: **11.00 AM TO 02.00 PM**
Max. Marks : 60

N.B.

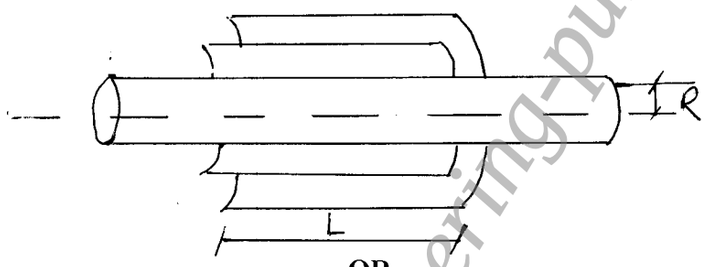
1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Answer to both the sections should be written in **SEPARATE** answer book.
4) Assume suitable data if necessary.

SECTION – I

Q.1 Gas A diffuses through a stagnant gas film to the surface of a nonporous cylindrical catalyst as shown in fig., where it undergoes the reaction **(10)**

$2\ A \xrightarrow{k_1} B$.

Gas B then diffuses from the catalyst surface and is swept away. Neglecting diffusion and reaction on the ends of the particle, derive an equation for the molar flux of A if the reaction is very fast.



OR

A tank initially contains 1.4 m^3 of brine solution with a concentration of 16 kg of salt per cubic meter of solution. A brine solution containing 48.0 kg of salt per cubic meter of solution enters the tank at rate of 8.5 m^3/h and is mixed perfectly with existing solution. **(10)**

(a) If the exiting stream reduced to 5 m^3/h, determine the time required for a salt in a tank to reach a concentration of 24.0 kg per cubic meter of solution.

(b) What is the volume of solution is the tank when this concentration is reached?

Q.2 What are the controlling factors of ionic separations? Discuss its applications in brief. **(10)**

OR

Describe the mechanism of Electrophoresis. Also discuss its commercial applications and design considerations. **(10)**

Q.3 The adsorption of SO_2 on mordenites was studied at 0°C **(10)**

(a) Using data below, determine the Langmuir constants and

(b) Calculate the total surface area of the solid. The density of liquid SO_2 at 0°C in the adsorbed phase is 1.43 g/cm^3

P_{SO2} (mm Hg)	Uptake (mmol/g)
5	1.75
10	2.20
15	2.40
20	2.62
30	2.72
40	2.85
50	3.00
60	3.05
70	3.12

P.T.O.

OR

a) Describe in detail affinity chromatography and immuno chromatography **(07)**

b) Discuss in brief pressure swing adsorption. **(03)**

SECTION – II

Q.4 Explain the steps involved in detail for the tray to tray calculation (by Lewis-Matheson method) in multicomponent distillation. **(10)**

OR

Describe in detail the working principle, construction and advantages of divided wall distillation column. **(10)**

Q.5 Explain the construction of a composite membrane and series resistances in membrane processes. Explain with diagram. **(10)**

OR

Describe in detail the process of dialysis and the different equipment used for the same. **(10)**

Q.6 Explain supercritical fluid extraction process, its working principle, the advantages it offers and give an example. **(10)**

OR

Discuss in detail the working of separation based on surface science. Give an example. **(10)**

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