राष्ट्रीय प्रौद्योगिकी संस्थान, हमीरपुर

National Institute of Technology, Hamirpur

B. Tech. (Chemical Engineering) - 6th Semester

End Semester Examination (3rd May, 2023)

CH – 321 Mass Transfer - II

Duration: 3 Hours

Max. Marks: 50

Note

- *Attempt all questions*
- *Wherever necessary, draw neat diagram, assume data if required*
- *Assign proper and correct number for each answer in the answer sheet*

1. Answer the following terms

   (2 x 6 = 12 Marks)

   a. Flash distillation with simple diagram
   b. Ion exchange with example
   c. Crystallization mechanism
   d. Leaching and steps involved in leaching
   e. Distribution coefficient
   f. Optimum reflux ratio with diagram

2. Explain the stepwise procedure for determining theoretical plates by McCabe Thiele method with label diagram and mention the limitation

   (8 Marks)

3. Derive the material balance equations involved for single stage leaching operation with proper diagram and graphical representation for no solid in the overflow (i.e. insolubility of insoluble solid (B) on pure solvent (A), B - free basis)

   (10 Marks)

4. Explain the selection criteria of adsorbents and describe the types of adsorption isotherm (type I to type V) as observed by Braunauer et al. 1940 with detail diagram labelling each type

   (10 Marks)

5. Determine the flow rate of extract and raffinate of the system that uses Chlorobenzene (B) as the pure solvent at phase 150 kg/sec to remove Pyridine (C) from water (A) which has a feed rate of 100 kg/sec and a composition of 45% and 55% respectively.

   (10 Marks)

Pyridine	Chlorobenzene	Water	Pyridine	Chlorobenzene	Water
0	99.95	0.05	0	0.08	99.92
11.05	88.28	0.67	5.02	0.16	94.82
18.95	79.90	1.15	11.05	0.24	88.71
24.10	74.28	1.62	18.90	0.38	80.72
28.60	69.15	2.25	25.50	0.58	73.92
31.55	65.58	2.87	36.10	1.85	62.05
35.05	61.00	3.95	44.95	4.18	50.87
40.60	53.00	6.40	53.20	8.90	37.90
49.00	37.80	13.2	49.00	37.80	13.20