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BOARD DIPLOMA EXAMINATION, (C-14)

OCT/NOV—2016

DCHE—FOURTH SEMESTER EXAMINATION

MASS TRANSFER OPERATION—I

Time : 3 hours]

[Total Marks : 80

PART—A

3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Write the applications of membrane separations.
2. Define mass-transfer operations.
3. State the phase rule.
4. State Fick's first law of diffusion.
5. Define mass-transfer coefficient.
6. Write about feed conditions in a distillation column.
7. Write McCabe-Thiele assumptions.

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- * 8. Define stripping operation with examples.
9. Define Raoult's law.
10. Explain material balance for an absorption operation.

PART—B

10×5=50

Instructions : (1) Answer *any five* questions.
 (2) Each question carries **ten** marks.
 (3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. Methane diffuses at steady state through the tube containing helium. At point 1 partial pressure of CH_4 is 55 kPa and at point 2 it is 15 kPa. The points 1 and 2 are 30 mm apart. The total pressure is 101.3 kPa and temperature is 298 K. Calculate flux of methane at steady state for equimolar counter diffusion. Diffusivity is $6.75 \times 10^{-5} \text{ m}^2/\text{sec}$.
12. (a) Explain process of diffusion, molecular diffusion and eddy diffusion with examples.
 (b) Write the names of unit operations that depends upon diffusion.
13. (a) Define interphase mass transfer. 4
 (b) Explain cocurrent, counter current and cross current contact operations. 6
14. Explain continuous distillation process with neat diagram.
15. A mixture of benzene and toluene containing 60 mol% benzene is to be separated to give a product of 95 mol% of benzene and bottom product containing 10 mol% benzene. The feed enters a column at its bubble point. It is prepared to operate the reflux ratio of 2.5. Calculate the number of theoretical plates needed and position of feed plate. The VLE data given below :

X	0	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Y	0	0.13	0.21	0.375	0.5	0.6	0.7	0.87	0.83	0.8	0.95	1

16. Define reflux ratio and explain minimum and optimum ratio.
17. Explain absorption operation in a packed column with diagram.
18. Explain choice of solvent for an absorption operation.