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NA—205—2023

FACULTY OF SCIENCE

B.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2023

(New Pattern)

INDUSTRIAL CHEMISTRY

Paper-VI

(Unit Operation-III)

(Tuesday, 26-12-2023)

Time : 2.00 p.m. to 4.00 p.m.

Time—2 Hours

Maximum Marks—40

N.B. :— (1) Attempt *all* questions.

(2) Use of log table and scientific calculator is allowed.

1. Explain the fractionating column with neat labelled diagram and rectification of ideal plates and material balance of rectifying section as well as stripping section. 15

Or

Solve the following problems :

- (a) A mixture of benzene and toluene boils at 368 K (95°C) under pressure of 101.325 kPa. Determine the composition of the boiling liquid assuming that the mixture obey Roul't's law at 368 K (95°C). The vapour pressure of benzene is 155.56 kPa and that of toluene 63.98 kPa. 8
- (b) Calculate the equilibrium compositions of the liquid and the vapour phases for the mixture of methyl alcohol and water at a temperature of 323 K (50°C) and under a pressure of 40 kPa. Assume the both liquid and vapour behave ideally. 7

Data of V.P. of methanol at 323 K (50°C) = 53.32 kPa.

V.P. of water at 323 K (50°C) = 12.33 kPa.

P.T.O.

2. What is liquid-liquid extraction ? Explain difference between the extraction and distillation operations. 15

Or

Solve the problems :

- (a) Ammonia from ammonia air mixture is to be absorbed in an absorption tower using water as solvent. 7

Data for

absorption system is as follows :

Air flow rate – 200 kg/h

liquid phase compositions

At the top of packing – 0.00013 kg NH₃/kg H₂O

At the bottom packing – 0.0006 kg NH₃/kg H₂O

Gas phase composition.

At top of packing – 0.0084 kg NH₃/kg inert gas.

At top of packing – 0.0044 kg NH₃/kg inert.

Calculate the flow rate of water entering the absorption tower (of gas absorption).

- (b) The picric acid is to be extracted with benzene, aqueous solution contains 0.2 mol of picric acid per litre. Calculate the quantity of benzene required to be contacted with 5 litres of aqueous solution in order to form a benzene solution containing 0.02 mol of picric acid per litre. Also calculate the percent extraction of picric acid.

$$K = C_E/C_R = 0.505$$

where, C_E = Concentration of picric acid in Benzene in mol/l.

C_R = Concentration of picric acid in water in mol/l.

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(3)

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3. Write short notes on (any *two*) :

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- (a) Simple distillation
- (b) Solubility curve with respect to crystallization
- (c) Energy balance in crystallisation
- (d) Supersaturation theory.

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