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SF-8316

B. E. III (Sem. VI) (Chem.) Examination

May / June – 2011

Mass transfer Operation - II

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 3 (Sem. 6) (Chem.)**

Name of the Subject :

☛ **Mass transfer Operation - II**

☛ Subject Code No. : **8 3 1 6** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Answer all the questions.

(3) Figures on the right side indicates the full marks.

(4) Assume the data whenever required and mention it clearly.

(5) Draw the diagram wherever required.

SECTION – I

1 (a) Answer the following : **2×5=10**

(i) Explain humid heat.

(ii) Differentiate adiabatic and nonadiabatic operation and also give the examples of the system.

(iii) What is absorption hysteresis ?

(iv) What is the principle of ion exchange ?

(v) Explain freeze drying.

(b) A batch of solid is to be dried from 25 to 6% moisture under certain condition. The initial weight of the wet solid is 160 kg and the drying surface is $1m^2/40kg$ dry weight. Determine the time of drying.

2 Answer any **two** : **2×8=16**

(a) Explain capillary movement and vapour diffusion for drying.

(b) Derive the Freundlich equation for the single stage adsorption.

(c) Explain the characteristics of unsaturated gas mixtures for humidification.

3 Answer any **two** : **2×7=14**

(a) Experiments on decolourization of oil yielded the following equilibrium relationship : $Y = 0.5\ x^{0.5}$.

Where $y = \frac{gm\ of\ colour\ removed}{gm\ of\ adsorbent}$

x = colour in oil $\frac{gm\ of\ colour}{1000\ gm\ of\ colourfree\ oil}$.

100 kg of oil containing 1 part of colour to 3 parts of oil is agitated with 25 kg of adsorbent. Calculate the % of colour removed if

(i) all 25 kg adsorbent is used in one step

(ii) 12.5 kg adsorbent is used initially followed by another 12.5 kg adsorbent.

(b) It is desired to dry a certain type of fibre board in sheets 0.131 m by 0.162 m by 0.071 m from 58% to 5% moisture (wet basis) content. The rate of drying period was formed to be 8.9 $kg/m^2.hr$. The critical moisture content was 24.9% and equation moisture content was 1%. The fibre board dried from one side only and has a bone dry density of 210 kg/m^3. Determine the time of drying.

(c) Discuss types of driers.

SECTION – II

4 Give all answers : **6×3=18**

(a) Explain feed tray location in distillation column.

(b) How the introduction of the feed influence the change in slope of operating line as working of distillation column.

(c) A solution containing 50 wt% methanol at 26.7 °C is to be continuously rectified at 1 std. atmospheric pressure at the rate of 5000 kg/hr to provide a distillate containing 95% methanol and a residue containing 1.0% methanol (by wt). The feed is to be preheated by heat exchanger with the residue which will leave the system at
37.8 °C.
Find the quantity of products in kg/hr and also in Kmol/hr.
M Wt. of Methanol = 32.04 Kg/Kmol
M Wt. of Water = 18.02 Kg/Kmol

5 Attempt any **two** : **8×2=16**

(a) Explain Negative Deviations from ideality with maximum boiling mixture - azeotropes using neat sketch diagram.

(b) Explain fraction distillation with material balance with mole and enthalpy basis.

(c) Explain Enthalpy Concentration diagram at constant pressure.

6 Attempt any **two** : **8×2=16**

(a) Explain Azeotropic distillation.

(b) Explain multi stage tray trowers with McCABE and THILE method.

(c) (i) Optimum Reflux ratio

(ii) Minimum Reflux ratio
