Registration No. :

Total number of printed pages – 2

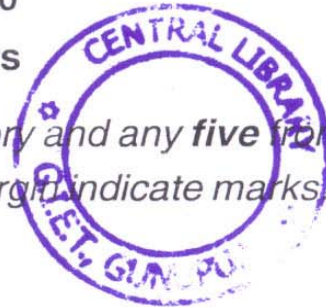Sixth Semester Regular Examination – 2014

MASS TRANSFER – II

BRANCH : CHEM

QUESTION CODE : F 250

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions :   2 × 10
   (a) Define fractional extraction.
   (b) Discuss about plait point with a neat sketch.
   (c) Name the extractor used in processing of radioactive solutions.
   (d) Coffee is prepared from coffee beans by leaching with _____.
   (e) Name some of the principal adsorbents in general use.
   (f) What should be the properties of a good adsorbent ?
   (g) Differentiate between bound and unbound moisture.
   (h) What are flights in rotary driers ?
   (i) What is the relation between critical moisture content and drying rate & thickness of solid ?
   (j) What are the advantages of continuous drying over the batch drying ?

2. Carbon disulphide is used to extract iodine from its saturated aqueous solution. The distribution of iodine between carbon disulphide and water at equilibrium is given by :

$$K = \frac{Y}{X} = \frac{g\ iodine/1\,|\ of\ CS_2}{g\ iodine/1\,|\ of\ water} = 600$$

Calculate the concentration of iodine in the aqueous phase when 1 l of saturated solution at 293 K containing 0.4 grams of iodine per 1 litre of water is stirred with 55 ml of CS_2. Repeat for two ideal extractions using 30 ml of solvent each time.   10

P.T.O.

3. Oil seeds containing 100 gm insoluble solid and 10 gm oil are contacted with 200 gm of fresh organic solvent in a single stage leaching operation. Determine the amount of oil left in the oil seeds after the leaching. The equilibrium data can be expressed as: $N = -4y + 8$

where, N = gm insoluble / (gm solvent + gm oil)

y = gm oil / (gm solvent + gm oil) in the seed phase,

and x = gm oil / (gm solvent + gm oil) in the solvent phase.

The tie line data are:

y	0.26	0.28	0.31	0.34
X	0.02	0.04	0.06	0.08

10

4. Experiments on decolourization of oil yielded the following equilibrium relationship: $y = 0.48 \times 0.48$

where, y = (gm of colour removed / gm of adsorbent) and x = colour in the oil, (gm of colour / 1000 gm of colour-free oil).

100 kg oil containing 1 part of colour to 3 parts of oil is agitated with 30 kg of the adsorbent. Calculate the % of colour removed if (a) all 30 kg adsorbent is used in one step and (b) 15 kg adsorbent is used initially, followed by another 15 kg of adsorbent.   10

5. A wet solid slab of 120 cm x 120cm x 5 cm is to be dried under constant drying conditions from 70 to 20 % moisture. The value of equilibrium moisture for the material is 1 %. If the critical moisture content is 62 % and the rate of drying at the critical point is 2 kg/hr.m², calculate the drying time. The dry weight of slab is 3 kg. All moisture contents are on wet basis.   10

6. (a) Discuss about the selection of solvent for liquid-liquid extraction.   5

   (b) Discuss about the Bollman extractor for carrying out leaching operation.   5

7. (a) Explain the working principle of ion exchange. Write the important applications of ion exchange operation..   5

   (b) With suitable plots, explain the rate of drying curve.   5

8. Write short notes on any **two** :   5 × 2

   (a) Equilateral triangular diagram

   (b) Types of adsorption

   (c) Shanks system

   (d) Rotary drier.