Registration No. :

Total number of printed pages – 2

Sixth Semester Examination – 2013

DOWNSTREAM PROCESS ENGINEERING

BRANCH : BIOTECH

QUESTION CODE : A195

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) What is affinity partitioning ?

    (b) A protocol calls for centrifugation at 6000 × g. What rpm should be used with a rotor of radii 10.7 cm to attain this g force ?

    (c) Write the differences between dialysis and electrodialysis.

    (d) Write the different types of rotors used for centrifugation.

    (e) What are the factors considered for choice of cell disruption methods ?

    (f) Write the differences between upstream process and downstream process engineering ?

    (g) Write the principle behind hydrophobic interaction chromatography.

    (h) Write the role of adsorption in downstream processing.

    (i) Write the principle behind crystallization.

    (j) How cross flow filtration is different from normal filtration.

2. Discuss different type of chromatography on the basis of different principles of operation. Write, in details, about the principle, instrumentation and application of HPLC.   10

P.T.O.

3. (a) Write in details about the process of cell disruption with suitable explanations. 6

(b) Aqueous two phase extraction is used to recover an enzyme from solution. A PEG dextran mixture is added and the solution separates into two phases. The value of K is 0.8. Calculate the maximum yield when 4

    (i) The volume of ratio of upper to lower phase is 3.

    (ii) The volume of ratio of upper to lower phase is 0.5.

4. (a) Write the theory of filtration. Give suitable examples of different filtration equipment. 5

(b) In the downstream processing involving a constant pressure filtration technique, following data was obtained at a gauge pressure of 1×10^5 Ps a.

Time (min)	8	27	54	90	140
Vol., lit	20	40	60	80	100

The fermentation broth contains 10 g of cells per liter of the slurry and the cells have a density of 900 kg/m³. The viscosity of the filtrate is 1×10^{-3} Pa s. Find the specific cake resistance (α) and equivalent cake thickness (L_m), if the cross sectional area of the filter press is 0.18 m². 5

5. (a) Discuss the different type of centrifugation on the mode of operation. Discuss the Basket centrifuge in details. 4

(b) Write in details about the process of ion exchange chromatography. 6

6. Write the principle drying. Discuss various types of industrial dryers basing on mode of operations. Discuss in details about freeze dryers. 10

7. Write a short note the following : 5+5

(a) Write a short note on dialysis.

(b) Write a short note on aqueous two phase separation.

8. Answer any *two* of the following : 5×2

(a) Affinity chromatography

(b) Ultrafiltration

(c) Microfiltration.