Paper Code: **BT-31A**	**Roll No.**										

M. Tech
THIRD SEMESTER EXAMINATION, 2016-17
BIOSEPARATION & DOWNSTREAM PROCESSING

[Time: 3 hrs.] [Max. Marks: 100]

Note: Attempt ***ALL*** questions. Assume suitable data, if required. All question carry equal marks.

1. Attempt any *four* parts of the following: - **(5x4=20)**

(a) Define Partition coefficient, logP and log D.
(b) Location factor in enzyme and protein release during cell disruption.
(c) Capacity factor and relative retention in chromatography and its significance.
(d) Explain Σ factor using tubular and disc stack centrifuge.
(e) Define pelleting efficiency of rotor. If the time to pellet a sample in "old" rotor is 20 min. Determine the time it would take for the same sample to pellet in a "new" rotor. K factor for old and new rotor is 3610 and1676 respectively.

2. Attempt any *four* parts of the following: - **(5x4=20)**

(a) Discuss the basic principle of ion exchange chromatography and its application.
(b) Elucidate the vapor diffusion method of crystallization.
(c) Describe the parameters affecting the cell disruption and rate of product release.
(d) Explain the principle and process of crystallization.
(e)Define "g" factor of a centrifuge. The culture broth is centrifuged in a EBA-20 centrifuge having a rotor radius of 100mm and a rotational speed of 10000rpm. If a worker, centrifuged the same sample in an another centrifuge having rotor radius of 80mm,then calculate the rpm that he applied. During the process g factor has been kept constant.

3. Attempt any *two* parts of the following: - **(10x2=20)**

(a) Write short notes on the any four of the following
   i. Filter cake
   ii. Rotatory vacuum filter
   iii. Spray drying
   iv. Pressure leaf filter
   v. Freeze drying
(b) Enumerate mechanical and non mechanical methods for the isolation of intracellular metabolites
(c) Define the sedimentation theory. A settling time is used to sediment microbial pellets with the density of 2.09gm/ $cm^3$and a diameter of 200µm.The particle free molecule has a density of 2gm/$cm^3$and viscosity is 1.1cP. Calculate the settling time by assuming that the pellets quickly reached their maximum terminal velocity.

4. Attempt any *two* parts of the following: - **(10x2=20)**

(a) Give the principle of centrifugation. Discuss the operation of tubular bowl and disc stack centrifuge.

(b) Discuss the challenges in bio separation engineering. Describe the criteria for the selection of recovery process for primary metabolite production.

(c) Calculate retention factor, relative retention, retention time and resolution of ethyl benzene and o-xylene mentioned in table

Analyte	Retention time (min)	Area	Peak width at the base
Solvent(t_m)	1.782	NA	NA
Benzene	4.938	598833	0.099
n-heptane	6.956	482864	0.100
Ethylbenzene	13.359	510009	0.092
o-xylene	13.724	618229	0.087

5. Attempt any *two* parts of the following: - **(10x2=20)**

(a) Discuss different types of stationary phases in liquid chromatography. Explain the basic principle of gel filtration and affinity chromatography and its application.

(b) A continuous disc-stack centrifuge is operated at 20,000 rpm for separation of baker's yeast. 60%cell recovery was at a feed rate of 50 L/min. At constant centrifuge speed, solids recovery is inversely proportional to flow rate. Find out the-

(i) Flow rate required to achieve 80% cell recovery if centrifuge speed is maintained constant.

(ii) Operating speed required to achieve 90% recovery at a feed rate of 50 L/min.

(c) Define filtration and derive an equation for time of filtration.