Register Number: ………………..

**B.TECH DEGREE EXAMINATIONS: NOV/DEC 2016**

(Regulation 2013)

Seventh Semester

**BIOTECHNOLOGY**

U13BTT702: Downstream Processing

**Time: Three Hours**                                              **Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 1 = 10 Marks)**

1.  Concentration of surfactant at which abrupt changes in surface tension and solubility is known

    a)  Minimum concentration               b)  Critical micelle concentration

    c)  Maximum concentration               d)  Surfactant concentration

2.  Thermal denaturation of proteins during ultrasonication can be prevented by _____

3.  Which of the following method is most efficient to separate very fine solid particles from solid-liquid mixture?

    a)  Filtration                          b)  Centrifugation

    c)  Precipitation                       d)  Settling

4.  Filter aids are used for _____.

5.  Distribution coefficient of proteins for extraction is always should be

    a)  1                                   b)  >1

    c)  0                                   d)  <1

6.  Example for uses non-porous membrane _____

7.  Gel filtration chromatography separates proteins on the basis of

    a)  Charge                              b)  Structure

    c)  Size                                d)  Mass

8.  Chromatographic separation is used for which one of the following

    a)  precipitation                       b)  product isolation

    c)  product extraction                  d)  product purification

9.  Which one of the following involves supersaturation

    a)  Crystallization                     b)  Precipitation

    c)  Freeze drying                       d)  Spray drying

10. Free flowing granular materials can be best dried in a _____ drier

**PART B (10 x 2 = 20 Marks)**

11.   Name the RIPP scheme in downstream processing?

12.   What are the factors affecting the efficiency of cell disruption in bead mill?

13.   List out the types of centrifuges used in downstream processing.

14.   How do filtration aids help to prevent cake for motion?

15.   Define selectivity in extraction.

16.   What is isoelectric focusing?

17.   List out the factors affecting resolution in chromatography.

18.   Write the principle of reverse phase chromatography.

19.   State the important factors for the dominance of crystallization.

20.   What are the special features of freeze drying?

# PART C (5 x 14 = 70 Marks)
## (Answer not more than 400 words)

**Q.No. 21 is Compulsory**

21.   a)   Describe various downstream processing operations in biotechnology with an example.

22.   a)   A lab scale filtration experiment of slurry with a solid content of 24.6 g/l in a filter of area 5 cm$^2$ with a pressure drop of 500 mmHg gives the following data. The viscosity of the filtrate is 1 cP.

| Vol. of filtrate, v, cm$^3$ | 30 | 40 | 50 | 60 | 70 |
|---|---|---|---|---|---|
| Time, t, sec | 6 | 10 | 16 | 23 | 31 |

(i) Calculate filter medium resistance and specific cake resistance.
(ii) Calculate the time required for filtration of 2 m$^3$ of the same feed slurry on a plate & frame filter consisting of frames of area 30 cm$^3$/frame.

**(OR)**

b)   Explain the principle and operation of disc stack centrifuge and derive the equation for volumetric capacity.

23.   a)   (i)   Explain the principle & applications of super critical extraction and (7+7) Ultrafiltration with suitable examples.

**(OR)**

b)   The partition coefficient value of an organic acid in solvent - water system is 2.7. i) Calculate the volume of organic solvent required to extract 99% of the acid from 50 ml of aqueous solution. ii) How many extractions with 50 ml of the organic solvent would be required to extract 99% of the acid?

24. a)     Discuss the principle and protocol for the separation of charged proteins by ion exchange chromatography.

**(OR)**

b)     Derive and discuss the equation for determination of column height in chromatography.

25. a)     Discuss various methods of supersaturation in crystallization of solutes..

**(OR)**

b)     Explain various stages of freeze drying for any two biotechnology products.

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