Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **14BT2020** | **Duration :** | **3hrs** |
| **Sub. Name :** | **DOWNSTREAM PROCESSING** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. |  | Discuss the general overview of bioseparation processes with case studies of (a) ethanol fermentation (b) citric acid production (c) production of intracellular enzyme (d) production of antibiotic. | CO1 | 20 |
| (OR) | | | | |
| 2. |  | Calculate the specific resistance of the cake (α) and the resistance of the filter medium (rm) on the basis of the following experimental data for a constant pressure filtration of a suspension of incompressible solids of concentration 30 kg/m3 on a filter medium area of 1 m2. The pressure drop was 2 bar = 2× 105 kg/m s2. The viscosity of the filtrate (η) is 1.1× 10-3 kg/ms.  **Vol.of the Filtrate V (m3) Time t (s)**  2×10-3 23  4×10-3 60  6×10-3 114  8×10-3 184  10×10-3 270 | CO1 | 20 |
| 3. |  | Derive the formula to calculate centrifuge time (tr) for tubular bowl centrifuge while considering the theory of centrifugal sedimentation with neat sketch. | CO1 | 20 |
| (OR) | | | | |
| 4. |  | A suspension of spherical particles of 0.1 mm diameter was allowed to settle in a column of 50 cm length. The density difference between the solid particles and the liquid was 0.05 g/cm3 and the viscosity of the liquid was 1.1 cP.  i) Calculate the settling time of the particles assuming that the particles reach their terminal velocity almost instantaneously.  ii) Calculate the settling time in a centrifuge rotating at 400 rpm if the distance between the axis of rotation and bottom of the centrifuge was 12 cm and the distance between the axis and the liquid surface was 3 cm (Given 1.1 cp = 0.011 gcm-1s-1). | CO1 | 20 |
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| 5. | a. | Explain liquid-liquid extraction process with its advantages, problems and equipments used for the process. | CO2 | 12 |
| b. | Discuss the principles of solvent extraction with the concept of partition coefficient and its ln form. | CO2 | 8 |
| (OR) | | | | |
| 6. |  | The partition coefficient value of an organic acid in organic solvent water system is 2.7.   1. Calculate the volume of organic solvent required to extract 99% of the acid from 50 ml of aquous solution. 2. How many extractions with 50 ml of organic solvent would be required to extract 99% of the acid ? | CO2 | 20 |
| 7. |  | Derive the process and equation for Continous Extraction Process. | CO2 | 20 |
| (OR) | | | | |
| 8. |  | Explain Microfiltration, Ultrafiltration membrane separation processes with suitable equations. | CO3 | 20 |
|  | |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. | a. | Give a brief account on principle and process of Lyophilization. | CO3 | 10 |
| b. | Give a detailed account on theory of drying and equipments with suitable examples. | CO3 | 10 |