**ST JOSEPH’S COLLEGE (AUTONOMOUS), BENGALURU -27**

**M.Sc. BIOTECHNOLOGY – III SEMESTER**

**SEMESTER EXAMINATION: OCTOBER 2022**

**(Examination conducted in December 2022)**

**BT9322: Industrial Biotechnology, Entrepreneurship and Bioethics**

**Time: 2.5 Hours Max Marks: 70**

**This paper contains TWO printed pages and THREE parts**

1. **Answer any TEN questions: 2m x 10 = 20 marks**
2. What are ATCC cultures?
3. Name the BIRAC opportunities available to start entrepreneurial ventures in India.
4. Name any two questions that help in idea generation.
5. Define a sunrise industry.
6. How is hydrodynamics of the mixing an important parameter in the design of a fermentor?
7. How are port’s sealed in a fermenter?
8. State any two factors as to why understanding downstream processing is important.
9. How is cross-linking different from absorption in immobilization?
10. The CEO of a company is experiencing losses from his industry. What can he do particularly change with respect to the microbes he is using for the product formation to make profits?
11. How does impeller speed impact oxygen transfer rate in a bioreactor?
12. Explain any two product extraction processes used in industrial biotechnology.
13. State the importance of efficient oxygen transfer rate in a bioreactor.

 **B. Answer any FIVE questions: 6m x 5 = 30 marks**

1. The image below details the Bioeconomy predictions.Can India achieve this realistic prediction? Justify your answer. List out three sub segments in the Bioindustrial segment.(3+3)
2. List out the value propositions for a venture that produces fungal metabolites for use as an add on in cosmetics.
3. With a neat labeled diagram explain the stirred tank fermenters.
4. What is a logical explanation to answer ethical questions on the safety of Bt cotton?
5. Write a note on cell disruption mechanisms for product extraction. Mention how it impacts downstream processing of the final product.
6. The rate of nutrient conversion to a useful product by *E. coli* follows the equation $2x^{2}+4x-6$. At time t=0, one nutrient molecule is converted to half of the product molecule. At time t=15hrs, the reaction is completed and all the nutrient molecules are converted to produce 5 product molecules. Find the roots, general equation and particular solution.
7. Answer the following(3+3)

a. Any 3 criteria important for bioreactor scale-up for Oxygen transfer rate

b. Importance of Lyophilization.

 **C. Answer the following : 10m x 2 = 20 marks**

1. a. Explain the strategies used for strain improvement. What are any two attributes that can be changed in a yeast strain? (8+2)

**OR**

b. What are unique aspects of biological processes that are considered for fermentor design? What are the advantages of airlift fermenters? (7+3)

1. a. Explain the overall production process of alcohol.

 **OR**

 b. i) Why is it important to understand the power consumption in industrial processes? (3)

ii) Briefly explain power consumption by impellers. (4)

iii) Discuss the criteria for scale up of the agitator. (3)