Reg. No. : | | | | | | | | | | | | |

Question Paper Code: 2145467

B.E. / B.Tech. DEGREE EXAMINATIONS, NOV / DEC 2024

Fifth Semester

Biotechnology

U20BT503 – BIOPROCESS ENGINEERING

(Regulation 2020)

Time: Three Hours Maximum: 100 Marks

Answer ALL questions

PART – A (10 x 2 = 20 Marks)

1. Distinguish the key factors affecting the enzyme activity.

2. List out the enzymes considered vital in industrial applications.

3. Expand and signify the key methods used for sterilizing air and liquid media in fermentation processes.

4. Mention the role of solid-state fermentation and submerged fermentation.

5. Signify the importance of using immobilized cells in bioreactor processes.

6. Describe the strategy for maximizing output in bioreactor operations. Comment the reason.

7. Define mass transfer coefficients.

8. State the functions of regime analysis in bioreactor.

9. Recall the eye advantages of using chromatography in bio separations.

10. Spell out the role of adsorption in bio separations and its significance in purification processes.

PART – B (5 x 16 = 80 Marks)

11. (a) Discuss the principles of enzyme catalysis, including the mechanism of action, and explain Michaelis-Menten kinetics. Include a detailed explanation of the significance of Km and Vmax in enzyme activity. (16)

(OR)

(b) Explain various methods of enzyme immobilization and discuss the mass transfer considerations involved in enzyme-catalyzed reactions. Why is immobilization important in industrial applications? (16)

12. (a) Expound the fermentation process in detail, highlighting the general requirements for fermentation. Discuss the basic design and construction of fermenters, including the key components and their functions. (16)

(OR)

(b) Compare and contrast aerobic and anaerobic fermentation processes. Discuss the production of microbial biomass, enzymes, antibiotics, and steroids through fermentation, highlighting the differences in approaches and recovery methods. (16)

13. (a) Discourse the various operational modes of bioreactors, including batch, fed-batch, and continuous modes. Highlight the advantages and disadvantages of each mode in terms of productivity, control, and application. (16)

(OR)

(b) Explicate the significance of agitation and aeration in bioreactors. Discuss how these factors affect mass transfer, mixing, and overall bioprocess performance.(16)

14. (a) Converse the significance of oxygen mass transfer in bioreactors, including microbial oxygen demands and the methods used to determine mass transfer coefficients. Explain how these factors affect bioreactor performance. (16)

(OR)

(b) Elucidate the scale-up criteria for bioreactors, focusing on oxygen transfer, power consumption, and impeller tip speed. Discuss how these factors are considered in the design of larger bioreactor systems. (16)

15. (a) Deliberate the various techniques used in bio separations, including biomass removal, disruption, and separation methods such as filtration, centrifugation, extraction, adsorption, and chromatography. Highlight the advantages and disadvantages of each technique. (16)

(OR)

(b) Evaluate the roles of filtration and centrifugation in bio separations. Discuss their operational principles, applications, and limitations in the context of biomass removal and product recovery. (16)

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