

Reg. No.

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B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019

Fifth Semester

BT16502 – BIOPROCESS ENGINEERING*(Biotechnology)***(Regulation 2016)****Time: Three Hours****Maximum : 100 Marks**Answer **ALL** questions**PART A - (10 X 2 = 20 Marks)**

	CO	RBT
1. What is cell recycling? List any two advantages of cell recycle cultivation.	1	U
2. Compare external-loop and internal-loop airlift bioreactors.	1	AN
3. Define microbial oxygen demand.	1	R
4. List the factors affecting the K_{La} in a bioreactor.	1	AN
5. List the different methods available for immobilizing the biomolecules.	2	R
6. Name any four polymers used in enzyme immobilization.	2	R
7. What is Single-cell model?	2	R
8. Define plasmid stability.	2	R
9. Write the advantages of recombinant cell cultivation.	3	U
10. List out the advantages of insect cell cultivation.	3	U

PART B - (5 X16 = 80 Marks)

11. (a) (i) Provide a schematic diagram of the chemostat with recycling by derivation show that (8) **1** **E**

$$S = \frac{K_s D(1 + \alpha - \alpha C)}{\mu_m - D(1 + \alpha - \alpha C)}$$

- (ii) Provide a schematic of diagram chemostat by derivation prove that (8) **1** **E**

$$\frac{1}{Y_{X/S}^{AP}} = \frac{1}{Y_{X/S}^M} + \frac{m_s}{D}$$

(OR)

- (b) (i) Give a detailed account on cell recycle cultivation. (8) 1 R
(ii) Explain two-stage cultivation in detail. (8) 1 R
12. (a) Explain the various methods used for the determination of oxygen mass transfer coefficient in bioreactors. (16) 1 U
(OR)
(b) Consider the up-scaling of bioreactor from 10 to 10,000 L vessel. The small bioreactor has a height-to-diameter ratio of 3. The impeller diameter is 30% of the tank diameter. Agitator speed is 500 rpm and three Rushton impellers are used. Determine the dimensions of the large bioreactor and agitator speed for
(i) Constant P/V
(ii) Constant impeller tip speed
(iii) Constant Reynolds number
Assume geometric similarity. (16) 1 E
13. (a) (i) Explain the bioreactor considerations in immobilized cell systems. (8) 2 AP
(ii) Discuss different methods of enzyme immobilization in detail. (8) 2 U
(OR)
(b) (i) Discuss the design and operation of packed bed bioreactors. (8) 2 AP
(ii) Explain membrane bioreactors in detail. (8) 2 U
14. (a) Explain in detail the structured models for the analysis of various bioprocesses. (16) 2 AP
(OR)
(b) Explain three different models of plasmid replication. (16) 2 U
15. (a) Explain in detail different host-vector systems used for recombinant cell cultivation. (16) 3 AN
(OR)
(b) Give a detailed account of process strategies, reactor considerations used for high cell density cultivation. (16) 3 AN