Q. Code: 862182

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

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

Fourth Semester

BT16405 – BIOPROCESS PRINCIPLES

(Biotechnology)

(Regulation 2016)

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

Answer **ALL** questions

PART A - (10 X 2 = 20 Marks)

		CO	RBT
1.	Brief the role of fermentation in bioprocess industries.	1	U
2.	Discuss why baffles are installed in the side wall of the fermentor leaving a small gap.	1	AN
3.	Distinguish defined and undefined medium.	2	AP
4.	List any four nitrogen sources used for the growth of the microorganisms in a fermentor.	2	R
5.	Differentiate depth and surface filter sterilization.	3	AP
6.	An unsterile broth contains initially 3.0×10^{10} viable cells. Calculate the Del factor of sterilization ($N_t = 10^3$).	3	E
7.	Discuss biomass and oxygen yield coefficients.	3	R
8.	Explain the degree of reduction and maintenance coefficient.	3	R
9.	Write the equation for the Luedking-Piret model.	4	R
10.	Differentiate batch and continuous cultivation.	4	AP

PART B - (5 X16 = 80 Marks)

11.	(a)	Illustrate the basic configurations of Continuous Stirred Tank Bioreactor and Air-lift bioreactor in detail.	**(16)**	1	U
		(OR)			
	(b)	Outline the main parameters to be monitored and controlled in the fermentation process.	**(16)**	1	U

12.	(a)	Explain the various nutrients used in the formulation of the fermentation medium and its importance in detail.	**(16)**	**2**	**AN**
		(OR)			
	(b)	Explain Plackett - Burman design for medium optimization and its advantages over classical method of medium optimization in detail.	**(16)**	**2**	**AN**
13.	(a)	Describe thermal death kinetics of microorganisms and explain how will you design a batch sterilization process.	**(16)**	**3**	**AP**
		(OR)			
	(b)	Explain various methods used for sterilization of liquid media and air in detail.	**(16)**	**3**	**U**
14.	(a)	The experimental measurements for an organism have shown that cells can convert two-thirds (w/w) of the substrate carbon (alkane or glucose) to biomass. a. Calculate the Stoichiometric coefficients for the following reactions: Hexadecane: $C_{16}H_{34}+aO_2+bNH_3 \rightarrow c(C_{4.4}H_{7.3}N_{0.86}O_{1.2}) + dH_2O + eCO_2$ Glucose: $C_6H_{12}O_6 + aO_2 + bNH_3 \rightarrow c(C_{4.4}H_{7.3}N_{0.86}O_{1.2}) + dH_2O + eCO_2$ b. Calculate the yield coefficients $Y_{X/S}$, $Y_{X/O2}$ for both the reactions. Comments on the differences. c. Calculate the degree of reduction for glucose.	**(16)**	**3**	**E**
		(OR)			
	(b)	Summarize the energetic analysis of microbial growth and product formation.	**(16)**	**3**	**E**
15.	(a)	Explain the growth stages of *Escherichia coli* in batch cultivation and various environmental factors affecting its growth.	**(16)**	**4**	**AN**
		(OR)			
	(b)	Discuss the various methods used for the estimation of biomass.	**(16)**	**4**	**U**