QP Code: RM23MTECH125 | Reg. No | | | | | | | | | | | AY 23

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech (Second Semester) Examinations, May – 2024

MPCCH2053 – Bioprocess Engineering

(Chemical Engineering)

Time: 3Hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer all questions	CO#	Blooms Level
a. Appraise the significance of the effectiveness factor in chemical reaction engineering.	CO2	K1
b. Categorize the epigenetic system and metabolic system in a saturated model.	CO4	K1
c. Analyze the applications of plug flow reactor.	CO3	K2
d. What is the role of an elicitor in plant defense mechanisms?	CO1	K3
e. Differentiate transduction and transformation when discussing gene transfer to bacteria.	CO3	K2
f. How does fed-batch culture contribute to higher biomass and product yields compared to traditional batch cultures?	CO1	K4
g. Draw and label the parts of bubble column reactor.	CO1	K3
h. What is microbial oxygen demand, and how does it relate to microbial activity in a given environment?	CO1	K4
i. What happens to the value of KLa when there is an increase in temperature?	CO4	K1
j. State down the different methods available for immobilizing bio molecules.	CO1	K2

PART – B **(10 x 5=50 Marks)**

Answer ***ANY FIVE*** questions	Marks	CO#	Blooms Level
2. a. Estimate the theoretical growth and product yield coefficients for ethanol fermentation by S. cerevisiae, as described by the following overall reaction: $C_6H_{12}O_6 \rightarrow 2\ C_2H_5OH + 2\ CO_2$	5	CO1	K2
b. Examine the theoretical predictions of yield coefficients	5	CO1	K3
3.a. Aerobic oxidation of glucose is accompanied by microbial growth. NH_4^+ is used as the nitrogen source and the end products are CO_2 and H_2O. The formula for bacterial cell is $C_5H_7NO_2$.Determine the coefficients for this microbial conversion. Assume that 40% of total electrons are used for biosynthesis and 60% are used for energy generation.	7	CO4	K4
b. Analyze the major Electron-Donor Half-Reactions of Glucose.	3	CO1	K2
4. a. Illustrate the design aspect of continuous sterilization processes a time period during which the medium is heated to the sterilization temperature, a holding	7	CO2	K2

	time at the desired temperature, and a cooling period to restore the medium to the fermentation temperature.			
b.	Justify the major advantages of the spiral heat exchanger are:	3	CO4	K1
5.a.	Justify the Growth, Non-growth and Mixed-growth cell growth kinetics based on the relationship between product synthesis and energy generation in the cell.	7	CO3	K3
b.	Describe the kinetic modelling of product production by Leudeking-Piret model using carbon source	3	CO1	K4
6. a.	Describe few Significant things of concern that should be taken into account while designing a fermenter**.**	7	CO3	K3
b.	Compare the various impellers use in bioreactors with their flow patterns.	3	CO1	K2
7.a.	Examine the thermodynamics of biological reactions where variation of reaction free energies for different electron donors and acceptors takes place	7	CO1	K2
b.	Calculate the Free-energy changes in bioreactions are calculated by using the formation free energies of products and reactants.	3	CO4	K1
8. a.	Formulate the Methods for Measurement of Cell Biomass and Cell Numbers for unicellular organisms.	7	CO1	K3
b.	Distinguish the Four phases of the growth cycle.	3	CO2	K2

--- End of Paper ---