BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: B. Tech **SEMESTER:** 7th
BRANCH: BIOTECH **SESSION:** MO/2023

SUBJECT: BE402 BIOREACTOR AND BIOPROCESS DESIGN

TIME: 2 HOURS **FULL MARKS:** 25

INSTRUCTIONS:
1. The total marks of the questions are 25.
2. Candidates attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

				CO	BL
Q1	(a)	Name any 6 components of a typical bioreactor.	[2]	CO1	BL1
Q1	(b)	Prove that in a chemostat, at steady state and for sterile feed, $\mu = D$.	[3]	CO1	BL3
Q2	(a)	An organism is used in chemostat culture in a 60 m^3 fermenter. The feed contains 12 g/L glucose and μ_{max} and K_s of the organism is 0.3 h^{-1} and 0.2 g/L respectively. What flow rate is required for steady state substrate concentration to reach 1.5 g/L? What will be the cell density at that flow rate? $Y_{x/s}$ = 0.06 g/g	[5]	CO2	BL4
Q3		It is desired to produce 100 kg fructose per day in a batch reactor by enzymatic reaction. Initial glucose concentration is 100 g/L. Conversion efficiency is 40%. If, $K_m = 5\times10^{-4}$ kg/m^3, $V_{max} = 1.5\times10^{-2}$ kg/m^3.sec. Down time is 6 h. Calculate the volume of the batch reactor, PFR and MFR.	[5]	CO2	BL5
Q4	(a)	Why scale down approach is employed?	[2]	CO3	BL2
Q4	(b)	Describe the gassing out methods of determination of K_La for aerobic fermentation.	[3]	CO1	BL3
Q5	(a)	A fed batch culture is operating with intermittent addition of glucose solution. The values of following parameters are given at t = 2 hours. Considering the system is at quasi steady state, calculate V_0, S and X for the system. Given: V = 1000 mL; S_0 = 100 g/L; Ks = 0.1 g/L; X_0 = 30 g; F = 200 ml/h; μ_{max} = 0.3 h^{-1}; Yx/s = 0.5 g/g.	[5]	CO2	BL5

::::::20/09/2023 M::::::