JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- OCT 2019

B.Tech V Semester

COURSE CODE: 15B11BT511 MAX. MARKS: 25

COURSE NAME: BIOPROCESS ENGINEERING

COURSE CREDITS: 04 MAX. TIME: 1.5 Hr.

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

[CO I, V]

1. i) Why is it important to run fermenter at positive pressure? **[1]**

ii) How does the Kolmogorov scale link with the shear forces generation in the agitated fermenter? **[2]**

ii) How does the foam control system work? **[2]**

2. Write down the functions of following components of the fermenter: **[4]**

a) Baffles **c)** Load Cell

b) Head Space Volume **d)** Sparger

3. Differentiate between following: **[3]**

a) Axial flow Impeller and Radial flow Impeller

b) Dynamic and static Gassing out Method

[CO II]

4. i) Cells become metabolically disturbed if DO level drops below C_{crit}. In some cases, metabolic disturbance due to this may be advantageous. Whether this statement is correct? Justify your answer with suitable at least two examples. **[2]**

ii) If you wish to improve the volumetric mass transfer coefficient (k_La) value of a fermenter, what factors will you consider while designing and operating a fermentation process? **[2]**

[CO III, IV]

5. A fermentation broth with viscosity 10^{-2} Pa s and density 1000 kg m^{-3} is agitated in a 2.7 m^3 baffled tank using a Rushton turbine with diameter 0.5 m and stirrer speed I s^{-1}. Estimate the mixing time. **[2]**

6. i) Determine the time (in minutes) required to reduce the number of viable spores from an initial value of 10^{10} to a final value of 1 if k_d value is 1.0 min^{-1}. **[2]**

ii) Sterilization at higher temperatures for shorter periods of time has the advantage of killing cells with limited destruction of medium components. Whether this statement is correct? Justify your answer. **[2]**

7. Ethanol is to be used as a substrate for single-cell protein production in a chemostat. The available equipment can achieve an oxygen transfer rate of 10 g O_2/l of liquid per hour. Assume the kinetics of cell growth on ethanol is of the Monod type, with μ_{max} = 0.5 h^{-1}, Ks = 30 mg/l, $Y_{X/S}$ = 0.5 cells/g ethanol, and $Y_{O2/S}$ = 2 g O_2/g EtOH. We wish to operate the chemostat with an ethanol concentration in the feed of 22 g/L. We also wish to maximize the biomass productivity and minimize the loss of unused ethanol in the effluent. Determine the required dilution rate and whether sufficient oxygen can be provided. **[3]**

JUNE T2 EXAMINATION OCT-2019