

## JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- Dec 2017

B.Tech 5<sup>th</sup> Semester

COURSE CODE: 15B11BT511

MAX. MARKS: 35

COURSE NAME: Bioprocess Engineering

COURSE CREDITS: 04

MAX. TIME: 2:00 Hrs.

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

1. What is the relationship between Kolmogorov scale and eddies size? How is it playing important role in protecting the cells from shear damage? [2]
2. A bioprocess is running at a constant pH 7.0. You have used 5% dead band for controlling the pH of the process. What should be the upper and lower dead band limit of the pH for the system? [2]
3. a) Define the significance of Damkohler Number and Effectiveness factor. [2]  
b) What are the advantages of using immobilized cell systems in the production of products? [2]
4. a) Why bottom entry impellers are not preferably used over the top entry impellers? [2]  
b) How the impeller speed affects the efficiency of oxygen delivery system? [2]
5. Differentiate between followings: [4]  
a) Growth and non-growth associated products  
b) Fixed Bed and Fluidized Bed Bioreactors
6. a) Draw the sketch diagrams for the various variants of Airlift Bioreactor with suitable labeling. [2]  
b) Which one is better: Airlift Bioreactor or Bubble Column Reactor and why? [2]  
c) Which one is better: External Loop or Internal Loop Airlift Bioreactor and why? [2]
7. How a dynamic gassing out method is different from a static gassing out method for the determination of volumetric mass transfer coefficient ( $K_{La}$ )? Explain how you will determine  $K_{La}$  value using dynamic gassing out method in flow chart format. [1+3]
8. a) What do you understand by Scale up? List the major considerations being used for the selection of scale-up criteria. [3]  
b) What are the major advantages of scale down of process? [2]
9. Consider the scale-up of fermentation from a 10 l to 10,000 l vessel. The small fermenter 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 fermenter and agitator speed for: [2+2]  
a) Constant P/V  
b) Constant Impeller Speed