Code: R7312301

R7

B.Tech III Year I Semester (R07) Supplementary Examinations, May 2013

TRANSPORT PHENOMENA IN BIOPROCESSES

(Biotechnology)

Time: 3 hours Max Marks: 80

Answer any FIVE questions
All questions carry equal marks
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1 What is diffusion coefficient? Explain Ficks law of diffusion

2 (a) If the velocity distribution of a fluid over a flat plate is given by $u = \frac{3}{4} y - y^2$ where u is the velocity in m/s at a distance of 'y' meters above the plate determine the shear stress at y = 0.15 m. Take the dynamic viscosity of the fluid as 8.5×10^{-5} kg – sec/m.
(b) Classify the types of fluids based on viscosity

3 (a) Write briefly on individual heat transfer coefficient and overall heat transfer coefficient.
(b) Draw the temperature profile due to heat transfer across a tube with fouling deposits on both surfaces.

4 (a) Explain a transfer process.
(b) What is the transport property for momentum transfer? Specify the units.
(c) What is the transport property for energy transfer? Specify the units. How does it vary with temperature?

5 Write short notes on:
(a) Effect of rheological properties on mixing.
(b) Factors effecting cellular oxygen demand.

6 Calculate the maximum rate of absorption of oxygen in a fermentor from air bubbles at 1atm pressure having diameters of 100 μm at 37º C into water having zero concentration of dissolved oxygen. The solubility of oxygen from air in water at 37º C is 2.26×10^{-4} kg mole O_2/m^3. The viscosity and density of water are 6.947×10^{-4} Pa.s and 994 kg/m^3. The density of air 1.13 kg/m^3. The Schmidt number for the system is 215. Agitation is used to produce air bubbles.

7 What is meant by macroscopic balances? Derive the equation for macroscopic mass balance in differential form.

8 What are the various theories of diffusional mass transfer? Explain the various correlations for calculating mass transfer coefficient.

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