BT-303 (Biochemical Engineering)

Quiz-2

Q1: A strain of *Azotobacter vinelandii* is cultured in a 15-m3 stirred fermenter for alginate production. Under current operating conditions, $k_L a$ is 0.17 s^{-1}. The solubility of oxygen in the broth is approximately 8 x10^{-3} kg m^{-3}.

(a) The specific rate of oxygen uptake is 12.5 mmol g^{-1} h^{-1}, What is the maximum cell concentration supported by oxygen transfer in the fermenter?

(b) The bacteria suffer growth inhibition after copper sulphate is accidentally added to the fermentation broth just after the start of the culture. This causes a reduction in the oxygen uptake rate to 3 mmol g^{-1} h^{-1}. What maximum cell concentration can now be supported by oxygen transfer in the fermenter?

Marks: 2.5+2.5

Q2: In a plug flow enzyme reactor of length *L* and cross-sectional area *A*, the substrate (s) entering the reactor with volumetric flow rate of *F*. The rate of substrate consumption is proportional to the volumetric rate of enzyme reaction ($v = \frac{v_{max}S}{K_m+s}$). Derive an expression for the residence time (t) in terms of substrate concentration and enzyme kinetic parameters.

Marks: 5
