

Code :BT05559

RA

III B.Tech II Semester(R05) Supplementary Examinations, April/May 2011
TRANSPORT PHENOMENA IN BIOPROCESSING
(Biotechnology)

(For students of RR regulation readmitted to III B.Tech II Semester R05)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions
All questions carry equal marks

1. (a) Write the boundary conditions for momentum transfer at solid - liquid interface, liquid - liquid interface, and gas - liquid interface.
 (b) Define viscosity and write the units.
2. What are the various factors affecting oxygen mass transfer rate in fermentation broths?
3. (a) Write the equation to calculate the interfacial area in an agitated bubble absorber and explain each term.
 (b) Write the correlation to calculate $K_L a$ for stirred vessels in highly non viscous media. With respect to the above correlation, what are factors on which $K_L a$ depend.
4. (a) Write the expression for the ratio of gassed to un gassed power as a function of operating conditions.
 (b) Define impeller Reynolds number and power number for Newtonian fluids.
5. (a) What are the factors to be considered while selecting an impeller for a particular operation.
 (b) Sketch the impellers used for low to medium viscosity liquids.
 (c) What are the important type of impellers used for mixing in agitated tanks.
 (d) Draw the figure and explain the arrangement of baffles set away from the wall for moderate viscosity liquids.
6. (a) plot the mixing factors verses Reynold's number correlation of mixing time for miscible liquids using a turbine in a baffled tank.
 (b) For scale up from vessel one to another size vessel with similar geometry and with the same power /unit volume in the turbulent region, write the relation for mixing times and diameters.
7. (a) What is conduction?
 (b) State Fourier's law of heat conduction.
 (c) The front of a slab of lead ($k = 35 \text{ W/m}^0\text{k}$) is kept at 110°C and the back is kept at 50°C . If the area of the slab is 0.4m^2 and it is 0.03m thick, compute the heat flux q , and the heat transfer rate, Q .
8. (a) Write the equation for Nusselt number.
 (b) Express Prandtl number in terms of heat capacity, viscosity and thermal conductivity of fluid.
 (c) Define Reynolds number.
 (d) Write the units of viscosity, heat transfer coefficient, thermal conductivity and heat flux.
