Code No: R5212306 **R5**

II B.Tech I Semester(R05) Supplementary Examinations, May/June 2010
TRANSPORT PHENOMENA IN BIOPROCESS
(Bio-Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Write briefly on the following mass transfer theories
   (a) Film theory
   (b) Penetration theory. [8+8]
2. What are the various factors affecting oxygen mass transfer rate in fermentation broths. [16]
3. (a) How does the power input to agitator influence the interfacial area.
   (b) Describe the influence of temperature and pressure on the oxygen transfer rate in fermentation broths. [6+10]
4. (a) Define power number and explain each term.
   (b) Define impeller Reynolds number and explain each term.
   (c) Define Froude number. What is its significance. [6+5+5]
5. (a) What is velocity profile.
   (b) Draw the velocity profile for flow through circular pipe.
   (c) Define velocity gradient.
   (d) What is viscous drag. [4+6+3+3]
6. Write the importance of scale up of equipment in an industry. [16]
7. (a) Draw the temperature profile for heat transfer between fluids separated by a solid wall.
   (b) Explain the formation of thermal boundary layer. [6+10]
8. (a) In a double pipe heat exchanger , benzene flows through the tube and is cooled from 70 to 38^0C by a refrigerant flowing on the outer surface of tube at 10 ^0C. Calculate the log mean temperature difference.
   (b) In a double pipe heat exchanger 0.8 kg/s of benzene is heated from 20 to 50^0C by steam condensing at 110 ^0Con the outer surface of the tube. Inside diameter of the tube is 19mm. Overall heat transfer coefficient is 450 w/m^2 ^0C. Calculate the total heat transferred and the length of heat exchanger tube. Specific heat of benzene is 1970 J/ kg ^0C. [6+10]

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