Registration No. :

Total number of printed pages – 2

Fifth Semester (Back/Special) Examination – 2013
UPSTREAM PROCESS ENGINEERING
BRANCH : BIOTECH
QUESTION CODE : D 301
Full Marks – 70
Time : 3 Hours

Answer Question No. **1** which is compulsory and any **five** from the rest.

The figures in the right-hand margin indicate marks.

1.   Answer the following questions :   2×10

   (a)   How thermal conductivity is varies with temperature ?

   (b)   What is meant by convective heat-transfer coefficient ?

   (c)   What is ideal solution ?

   (d)   What should be properties of a good adsorbent ?

   (e)   A smooth pipe of diameter 400 mm and length 800 m carries water at a rate
         of 0.04 m^3/ sec. Determine the head lost due to friction. Take kinetic
         viscosity $0.018 \times 10^{-4} m^2$/sec.

   (f)   What do you mean by Non-Newtonian fluids ? Give with example.

   (g)   Draw a sketch of flow in boundary layers.

   (h)   Give two examples of industrial screening equipments.

   (i)   Name two sections of fractionating column.

   (j)   Define drop-wise condensation.

2.   (a)   Define and derive the expression of LMTD.   5

   (b)   Water enter a two fluid heat exchanger at 55°C and leave at 85°C. Hot
         gases enters at 305°C and leaves at 160°C. if the total heat transfer area is
         500 m^2 and overall heat transfer coefficient is 600 Kcal/hr $m^{2}\,°C$.
         Determine the total heat transferred per hour for parallel flow and counter
         flow of the two fluids.   5

P.T.O.

3. (a) Write in brief with sketches on fractionating column. Derive the operating line equation for rectifying section and stripping section. 5

   (b) Differentiate adsorption from absorption. Write in brief on adsorption equillibria ? 5

4. A cold-storage room is constructed using an SS wall followed by a cotton wool wall followed by a thick brick wall to maintain the temperature inside the room at -20°C. the outer temperature is 28°C. Calculate the rate of heat loss per unit area of the wall and the temperature in between each wall. The properties and thickness of the walls are as follows. 10

Materials	Represented by	Thickness (mm)	Thermal conductivity W/m°C
SS	A	6	21
Cotton wool	B	40	0.04
Brick	C	20	0.7

5. (a) Briefly write the mass balance of heat Transfer equipments, with reference to evaporator system. 5

   (b) Differentiate between Orifice meter and Venturi meter. 5

6. (a) Classify the fluid according to the shear stress versus velocity gradient plot. 5

   (b) Plot the shear stress and velocity gradient distribution of a viscous fluid flowing through a circular pipe. 5

7. (a) What do you mean by size reduction ? Discuss the various principle and objective of size reduction. 5

   (b) Define and derive the Roult's law. 5

8. Write short notes on any **two** of the following : 5×2

   (a) Fick's law of diffusion

   (b) Azeotropes

   (c) Bernoulli equation.