Printed Pages : 4

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NBT-402

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 154412

Roll No. | | | | | | | | | | |

B.Tech. (IV Semester)

SPL. THEORY EXAMINATION, 2014-15

HEAT & MASS TRANSFER

Time : 3 Hours] *[Total Marks : 100*

Note: Attempt all questions. Assume suitable data, if required. All questions carry equal marks.

1. Attempt any four parts of the following: 5×4

   (a) Differentiate between ideal and non-ideal solutions with suitable example.

   (b) Derive the expression for heat- transfer rate for steady state conduction through a cylindrical wall.

   (c) Differentiate between Film wise and Drop wise condensation with suitable example.

   (d) Discuss NTU & HETP with suitable examples.

(c) What is equilibrium yield of crystallisation? Describe briefly the various types of batch and continuous crystallizer that are used for industrial applications.

5. Write short notes on any four of the following : 5×4

   (a) Free convection

   (b) Absorption in tray column

   (c) Thermal conductivity of a material

   (d) Gray body & Black body

   (e) Henry's Law

   (f) Critical thickness of insulation

—x—

(e) What do you mean by Selection of solvents? Explain with suitable example.

(f) Explain Langmuir isotherm with suitable example.

2. Attempt any two parts of the following: 10×2

(a) Water enters a two fluid heat exchanger at 55° C and leaves at 85°C. Hot gases enter at 305°C and leaves at 160°C. If the total heat area is 500 M^2- and the overall heat transfer co-efficient is 600 kcal/ hr m^2°C, determine the total heat transferred per hour for parallel flow of the two fluids.

(b) Discuss Wien's displacement law. Also derive the expression for view factor calculation with suitable examples.

(c) Define Knudsen diffusion. Also discuss the Fick's law of diffusion with suitable example.

3. Attempt any two parts of the following: 10×2

(a) A triple effect evaporator is being operated in continuous mode. Discuss the empirical correlations used to estimate the heat transfer rates.

(b) Explain the surface renewable theory of mass transfer at fluid surfaces. Give the complete procedure for the determination of mass transfer coefficients with suitable examples.

(c) In an O_2-N_2 gas mixture, the concentrations of oxygen at two planes 3 mm apart are 12% and 24% by volume respectively. Determine the flux of diffusion of oxygen if nitrogen is non-diffusing. Total pressure: 101325 N/m^2, Temperature: 27°C and $D_{O2\text{-}N2} = 1.984 \times 10^{-5}\ m^2/s$.

4. Attempt any two parts of the following: 10×2

(a) Explain the construction and working of a spray dryer with the help of neat sketch. Also give the classification of dryers.

(b) Define equilibrium moisture content. A wet solid is to be dried from 38% to 8% moisture under constant drying conditions in 6 hrs. If the equilibrium moisture content is 6% and critical moisture content is 14% how long it will take to dry solids to 10% moisture under the same conditions.