Time – 3 hrs   **Marks -80**

N.B –   **Question no 1 is compulsory.**
Solve any three questions from remaining five questions.
Assume suitable data if necessary.

Q.1	a)	Write and explain Fick's law of diffusion	3
	b)	Explain Absorption factor and Stripping factor	5
	c)	Explain Knudsen Diffusion with its equation	4
	d)	Define Cascade, Equilibrium Moisture content, Humid heat, Unbound moisture.	8

Q.2 a) The diffusivity of gas pair O_2-CCl_4 is determined by observing 10
the steady state evaporation of CCl_4 (liquid) into a tube
containing O_2. The entire system is held at constant
temperature and pressure. Both the gases are assumed to be
ideal and O_2 is stationary. The distance between the CCl_4
(liquid) level and top of the tube is 0.171 m. The total pressure
on the system is $100.658*10^3$ N/m^2 and temperature is 273^0K.
The vapor pressure of CCl_4 is $4.399*10^3$ N/m^2 at that
temperature. The crossectional area of the tube is $0.082*10^{-3}$
m^2. After steady state is attained, $0.0208*10^{-6}$ m^3 of CCl_4
(liquid) evaporated in a $36*10^3$ seconds period. What is the
diffusivity of gas pair O_2-CCl_4 ? Assume specific gravity of liquid
CCl_4 as 1.59.

b) Explain difficulties of Packed tower like Flooding, Priming, 10
Coning, Weeping, and Entrainment of liquid droplets are to be
handle in detail.

Q.3 a) Derive the relation between overall Mass Transfer Coefficient 10
and Individual Mass Transfer Coefficient in both gas phase and
liquid phase controlled

b) Write Short note on   10

      i.   Sparged Vessel
      ii.   Venturi scurbber

Q.4 a) Compare Packed tower and Tray tower   8

b) An air-ammonia mixture containing 5% ammonia by volume is absorbed in water at 20⁰C in a tower packed with 1.27cm raschig rings. The water and the gas rates are 1170 Kg/hr m² each based on an empty tower cross section. Estimate the height of tower required if 98% the ammonia in the entering gas is to be absorbed. The tower operates at 1 atm pressure. The equilibrium relation is given as y= 0.746x.   12

where, y= mole fraction of ammonia in air, and

     x= mole fraction of ammonia in water.

Overall height of the transfer unit can be taken as 2 meter.

Q.5 a) Give classification of cooling tower. Explain mechanical draft cooling tower in detail   8

b) 1) Explain in detail Typical rate of Drying Curve with neat diagram.   6

     2) Explain mechanism of drying.   6

Q.6 Write short note on any four   20

   a) Wetted wall column
   b) Diffusion through polymers
   c) Rotary drum dryer
   d) Tray Efficiency
   e) Packing used in absorption column