Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. MAKEUP EXAMINATIONS- JUNE 2018

SUBJECT: Mass Transfer -1 [CHE 2203]

REVISED CREDIT SYSTEM, (14/06/2018)

Time: 3 Hours **MAX. MARKS: 50**

Instructions to Candidates: Answer ALL the questions. Missing data may be suitable assumed.

1.	Ammonia is diffusing through nitrogen. The total pressure is 206.8 KN/m^2 and the temperature is 60 ^0C. Calculate the rate of diffusion of the ammonia through a film of gas 0.5 mm thick when the concentration change across the film is 10 to 5 % Ammonia by weight. Consider both extreme cases which can be solved. Data: Ammonia: ε/k=558.3; r=0.29 nm, Nitrogen: ε/k=71.4; r=0.3798 nm	**10**
2	Estimate the mass transfer coefficient and mass transfer flux when pure CO_2 at 1 atm and 25 ^0C into water flowing as film down a vertical wall of 1.5 m long at the rate of 0.08 Kg/s per meter of width. The gas is pure CO_2 and water is essentially CO_2 free initially. Assume the diffusivity of CO_2 in water is $2x10^{-9}$ m^2/s and concentration of CO_2 in water at that temp and pressure can reach to 0.0336 $kmol/m^3$. The density and viscosity of solution is 1000 kg/m^3 and $1x10^{-3}$ Pa/s.	**10**
3A.	It is desired to dry 10 kg of soap from 20% moisture (wt.) by contact with hot air. The wet soap is placed in a vessel containing 8.06 m^3 of air at 45 ^0C & 1 atm with water vapour partial pressure of 1.6 Kpa. The system is not allowed to reach equilibrium and stopped when the moisture in air reaches to 13%. Find the absorption factor at this condition. The equilibrium data was represented as $Y = -0.7135 X^2+0.4636X+ 0.0039$	**5**
3B.	Explain the 10 points to select/choose the tray or packed tower for a given system	**5**
4	A coal gas is to be freed of its light oil by scrubbing with wash oil as an absorbent. Gas in 0.3 m^3/s at 26 ^0C and $p_t = 1.07x10^5$ N/m^2 containing 3% by volume of light oil vapors. The light oil will be assumed to be entirely benzene and a 90% removal is required. Wash Oil and Benzene solutions are ideal solution and temperature is constant (vapour pressure of benzene at 26 ^0C is 13330 N/m^2) wash oil is to enter at 26 ^0C, containing 0.005 mole fraction benzene. Find the number of theoretical stages required for an oil circulation rate of 2 times of minimum oil rate is to be used.	**10**
5A	Explain the following adsorbents preparation method and end uses: a) Fullers earths b) Activated clays c) Bauxite d) Alumina and 4) Bone char	**2**
5B	Define humid heat and humid volume	**6**
5C	Briefly explain the adsorption hysteresis phenomena with the help of graph	**2**