Total No. of Questions : 6]

SEAT No. :

P1445

[Total No. of Pages : 2

TE/Insem/APR-135
T.E. Chemical
TRANSPORT PHENOMENA
(2015 Pattern) (Semester - II)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data if necessary.***

Q1) Derive the expressions for Momentum flux, velocity profile. maximum velocity. average velocity for a fluid through annulus. **[10]**

OR

Q2) a) List down the assumptions for Hagen Poiseuille's Law. **[5]**

b) A horizontal annulus is 27 ft long. The outside radius of inner cylinder is 0.495 inch. The inside radius of outside cylinder is 1.1 inch. The fluid density is 80.3 lb/ft^3 and viscosity is 136.8 lb.m/ft.sec. What is the volume rate of flow, the impressed pressure drop is 5.39 psi? **[5]**

Q3) Derive the expressions of heat flux and temperature distribution for viscous heat source. **[10]**

OR

Q4) Derive the expressions of heat flux and temperature distribution through variable thermal conductivity. **[10]**

Q5) Derive the expressions for molar flux. concentration profile and average concentration for diffusion through heterogenous chemical reaction. **[10]**

OR

P.T.O.

Q6) a) The diffusivity of the gas-pair O_2 - $CC1_4$ is measured by observing the steady-state rate of evaporation of $CC1_4$ into a tube containing O_2. The distance between the $CC1_4$ liquid level and the top of the tube is 17.1 cm. The total pressure of the system is 755 mm Hg and the temperature is 0°C. The vapor pressure of $CC1_4$ at that temperature is 33 mm Hg. The cross-sectional area of the diffusion tube is 0.82 cm^2. It is found that 0.0208 cm^3 of $CC1_4$ evaporates in 10 hour period after steady-state has been attained. What is the diffusivity of the gas-pair O_2 - $CC1_4$? You may assume that the concentration of $CC1_4$ at the top of the tube is zero and the density of liquid $CC1_4$ is 1.59 g cm^{-3}. **[5]**

b) List down the steps involved in approach for solving mass transfer problems. **[5]**

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