

Total No. of Questions : 6]

SEAT No. :

P1430

[Total No. of Pages : 2

TE/Insem/APR-35
T.E. (Chemical) (Insem)
TRANSPORT PHENOMENA
(2012 Pattern)

Time : 1½ Hour]

[Max. Marks : 30

Instructions to the candidates :

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Figures to the right side 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) A viscous fluid is flowing through the horizontal capillary tube. Find radius of capillary from following data : **[10]**

Length of capillary = 50.02 cm

Kinematic viscosity of fluid = $4.03 \times 10^{-5} \text{ m}^2/\text{s}$

Density of fluid = 955.2 kg/m^3

Pressure drop across capillary tube = $4.829 \times 10^5 \text{ N/m}^2$

Mass flow rate through tube = $2.997 \times 10^{-3} \text{ kg/s}$

OR

Q2) Derive momentum flux and velocity expression for flow of fluid along an inclined pipeline. **[10]**

Q3) Derive the expression temperature distribution for viscous heat source. **[10]**

OR

Q4) A copper wire has a radius 2 mm and length 5 m. For what voltage drop would the temperature rise at the wire axis be 10°C if the surface temperature of the wire is 20°C ? For copper, Lorenz number is $2.23 \times 10^{-8} \text{ volt}^2\text{K}^{-2}$. **[10]**

P.T.O.

Q5) a) Explain boundary conditions to solve mass transfer problems. **[4]**

b) Explain Ficks law and mass balance equation at steady state. **[6]**

OR

Q6) Derive the expression of molar flux for instantaneous heterogeneous polymerization reaction. **[10]**

