M. Tech. –I (Chemical) (2011Course) Choice Based Credit System :
WINTER - 2018

SUBJECT : ADVANCED TRANSPORT PHENOMENA

Day : Wednesday **Time :** 11.00 AM TO 02.00 PM
Date : 05/12/2018 **W-2018-3349** **Max. Marks : 60**

N.B.

1) All questions are **COMPULSORY**.
2) Figures to the **RIGHT** indicate **FULL** marks.
3) Assume suitable data, if necessary.
4) Answers to both the sections should be written in **SEPARATE** answerbooks.

SECTION – I

Q.1 What is the Science of Rheology? Describe the two parameter models in brief. **(10)**

OR

Consider the steady state axial flow of an incompressible liquid in an annular region between two coaxial cylinders of radii kR and R. The fluid is flowing upward in the tube-that is, in the direction opposed to gravity. Make a differential momentum balance and obtain the expressions for momentum flux and velocity distribution.

Q.2 Describe the friction factor correlations for flow through packed column and derive the **(10)**

a) Blake - Kozeny equation and
b) Burke - Plummer equation.

OR

What are the steady and unsteady state

i) Macroscopic momentum balance and
ii) Macroscopic Energy balance.

Q.3 Derive an expression for temperature distribution for heat conduction in a cooling fin. **(10)**

OR

Develop a formula for the overall heat transfer coefficient for the composite cylindrical pipe wall.

SECTION – II

Q.4 What are the heat transfer coefficient correlations for forced convection through packed bed? **(10)**

OR

A slab occupying space between y = – b and y = + b is initially at temperature T_0. At time t = 0 the surface at $y=\pm b$ are suddenly raised to T_1 and maintained there. Find T (y, t).

Q.5 Consider the steady state diffusion of A through stagnant B with the liquid – vapor interface maintained at a fixed position. Make a differential mass balance and develop an expression for concentration profile. **(10)**

OR

Derive the equations of continuity for multicomponent mixtures.

Q.6 What is Chilton Colburn analogy for simultaneous heat and mass transfer? **(10)**

OR

Describe the macroscopic balances for multicomponent systems.

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