Code No: NR410801 **NR**

IV B.Tech I Semester Supplementary Examinations, April/May 2005
TRANSPORT PHENOMENA
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the physical interpretation of t_{yx}.
   (b) Define shear stress and momentum flux. Prove that shear stress and momentum flux have the same units.

2. An incompressible fluid is flowing in steady state in the annular region between two coaxial circular cylinders of radii KR and R. Obtain expressions to find out momentum flux distribution and velocity distribution.

3. Show that the Nusselt number = 2, for heat conduction from a solid sphere to surrounding stagnant fluid. Use shell energy balance.

4. A liquid flows on a vertical wall of length 'L' coated with material A. Material 'A' is slightly soluble in liquid B. Assuming plug flow and short contact time (L/V max.), obtain a solution for average mass flux N_A as function of length 'L'.

5. An infinite horizontal slab uniform width 'h' has its upper and lower surface maintained at concentration Cao and Zero respectively. Determine the steady-state concentration profile in the slab. Calculate the flux for both surfaces at steady state conditions.

6. Explain the following:
   (a) The partial time derivative
   (b) Total time derivative
   (c) Substantial time derivative
   (d) Navier-stokes equation.

7. Determine the velocity and shear stress distribution for the tangential laminar flow of an incompressible fluid between two vertical coaxial cylinders, the outer one of which is rotating with angular velocity Ω. End effects may be neglected

8. Find the time smoothed velocity distribution for turbulent flow in a long tube using the Prandtl mixing-length relation. Take the radius and length of the tube as R and L.

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