R09

Code No: C5102

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech I Semester Examinations, March/April 2011

ADVANCED TRANSPORT PHENOMENA

(CHEMICAL ENGINEERING)

Time: 3hours **Max. Marks: 60**

Answer any five questions

All questions carry equal marks

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1. 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 an angular velocity Ωo .End effects may be neglected. [12]

2. Derive and discuss about Maxwell –Stefan equation. [12]

3. A fluid of constant ρ and μ is contained in a very long horizontal pipe of length L and radius R. Initially the fluid is at rest. At t = 0, a pressure gradient $P_0 - P_L / L$ is impressed on the system. Determine how the velocity profiles change with time. [12]

4. Derive the equation for "steady two – dimensional flow of heat in solids". [12]

5. Obtain a description of the incompressible flow pattern near the leading edge of a flat plate immersed in a fluid stream. [12]

6. Obtain the temperature profiles near a flat plate immersed in a viscous fluid. The wetted surface of the heated plate is maintained at T_0 and the temperature of the approaching fluid is T_∞. [12]

7. a) Compare between laminar & turbulent flow. [4]
   b) Discuss about time – smoothed velocity profile near a wall. [8]

8. Write short notes on the following.
   a) Thermal Boundary layer and Potential flow [6]
   b) Macroscopic Mass and energy balance equations. [6]

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