AE/ME 339
Home Work Problem

The temperature distribution in a circular rod of length, L, and thermal diffusivity, α, is to be determined. The rod is insulated on the sides and the 1D heat conduction equation can be used for the solution.
Use the **Crank-Nicolson** method to determine the temperature variation with time and position. First, rewrite the unsteady, one-dimensional governing equation in the non-dimensional form using the following non-dimensionalization scheme.

$$\theta = \frac{T - T_0}{T_1 - T_0}, \quad \tau = \frac{\alpha t}{L^2}, \quad \xi = \frac{x}{L}$$

Initial condition: Temperature is uniform at T_0

Use the following boundary conditions:

a. Left boundary at T_1 and right boundary insulated.

The initial and boundary conditions also need to be written in the non-dimensional form.

- Plot the non-dimensional temperature (θ) distributions at τ = 0.35, 0.25, 0.1 and 0.05.
- Discuss the choice of grid size and time step size with regard to stability and accuracy.
- Include a copy of your computer program and representative printed results.

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