Home Work Problem 5

An infinite parallel-sided slab of length ($0 \leq x \leq L$) of thermal diffusivity α is initially (t = 0) at uniform temperature T_0. Its two ends are subsequently maintained at a constant temperature T_1. Use the explicit 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.

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

Plot the temperature (θ) distributions at $\tau = 0.35, 0.25, 0.1$ and 0.05.
Discuss the choice of time steps with regard to stability and accuracy.
Include a copy of your computer program and representative printed results.

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