

Instructions

- Make a document (either in .doc and .pdf) containing code, results. Named the file using both of your Roll nos. *i.e.* 140100001_140100002
- Write Up: (i) Software in which code is written, (ii) output results for each case, and (iii) explanation of results.
- Please upload all assignments to turnitin

Assignment 7

Due date: 07/11/2017, time: 12 midnight

One-dimensional Parabolic Equation

One end of a one-dimensional copper bar of width 1.0 m (thermal conductivity of the slab is 400 W/m.K, the specific heat is 385 J/kg.K, density is 8000 kg/m³). The bar is initially ($t = 0$) at a uniform temperature of 25 °C. At $t > 0$, the surface temperatures of the left ($x = 0$) and right ($x = L$) faces are suddenly increased to 400 °C, and maintained at this temperature thereafter. There are no sources within the wall. Determine the time at which the middle length temperature reaches 200 °C. Plot the variation in temperature with time at middle length from 0 to 900 s, using the following schemes

- 1) Fully explicit method: FTBS
- 2) Du-Fort Frenkel Scheme
- 3) Fully implicit method and,
- 4) Crank-Nicholson scheme

USE the following values of $\Delta t = 1, 0.5, 0.1$ s.

1. For each of these values of Δt , solve using the following values of Δy : 0.1, 0.2 and 0.5 m