

ESO 208A; ESO 218

Computational methods in engineering

Assignment # 11

Due date: November 15, 2013

This will be considered as a project and will carry 5 % weightage for the course grading.

1. Consider the following 1-D heat conduction equation for a thin rod of length = 10 units. Assume the coefficient, $\alpha=0.2$

$$\frac{\partial T}{\partial t} - \alpha \frac{\partial^2 T}{\partial x^2} = 0$$

Initial conditions: $T(x,0) = 0.0$ for all x

Boundary conditions:

At $x=0$, $T = 50$ for all t and at $x=10$, $\frac{\partial T}{\partial x} = 0$ for all t .

- a. Formulate the problem in explicit finite difference method.
- b. Prepare a flow chart for the above problem to find the temperature at $t=20$.
- c. Write a computer program using the flow chart.
- d. Plot the results for the temperature at $t=20$.
- e. Use three different values of Δx {=2, 1 and 0.5) and show the effects on the results.