Computational Fluid Dynamics (AE/ME 339)
MAEEM Dept., UMR, Fall 2002

Home Work Problem 6

An infinitely long bar of thermal diffusivity α has a square cross section of side 2a. It is initially at a uniform temperature T_0 and then suddenly has its x = 0 and x = 2a surfaces raised to a temperature T_1, and the y = 0 and y = 2a surfaces raised to temperature T_2. These surface temperatures are held constant at those values subsequently. Compute the temperature distribution T(x,y,t) inside the bar using the ADI method.

1. Obtain numerical solutions for the following data: $\alpha = 1.3 \times 10^{-5}$ m^2/s, a = 20 cm, T_0 = 20C, T_1 = 80C, T_2 = 60C.

2. Plot the dimensional temperature distribution along a line AB parallel to x axis for which y = 10 cm, for time t = 610s, 1200 s and 2300 s. Include printed output for temperature distribution in the planes of symmetry for t = 610 s.

3. Present your results and discuss the solution. Your submission should include a brief description of the problem, program listing, the solution technique, convergence, and accuracy.