CE 601 NUMERICAL METHODS

TUTORIAL – 9

No Marks **Date: 15-November-2012**

This tutorial is not required to be submitted for evaluation. This is a practical tutorial and you may solve the problems on your own. You may also use computational programs like Matlab, Mathematica, Fortran, C, C++, etc. or any other convenient programming language (maybe even MS-Excel) to evaluate operations like additions, multiplications, matrix operations, etc.

1. Use Euler's explicit method and modified Euler's method to solve the following initial value ODE $\frac{dy}{dt} = ty + y^2$; with the initial conditions $y(0) = 1.0$ for $t = 0.1, 0.2$, and 0.3.
2. Solve the following initial value ODE $\frac{dy}{dt} = t^2 + y^2 - 2$; $y(0) = 1.0$ for $t = 0.3$ and 0.4.
3. Solve the following boundary value ODE using finite-difference method $\frac{d^2y}{dx^2} + y + x = 0$; $0 \le x \le 1$; $y(0) = 0.0; y(1) = 0.0$ for the entire domain. Use a grid size of $\Delta x = 0.25$.
4. Solve the following partial differential equation $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = -\frac{\dot{Q}}{k}$ on heat transfer in a flat plate conductor of length 1.5 cm and width 1.5 cm, where $\dot{Q}$ = 400 J. $cm^{-3}s^{-1}$, and k = 0.4 $J.cm^{-1}.C^{-1}$. The four sides of the conductor are held at 0 ^{0}C.