ME 542

Assignment – 7

Nonlinear Equations

- Students need to save all the programs in a zipped file and name it after their roll number and submit on MS TEAMS.
- The programs are to be compiled and checked before submitting.
- Results obtained by your code should be written (do not copy image file of your run) in a pdf file and keep it in the same zipped folder.
- Make one program that can solve all problems.

1. Solve the following using Newton's method. Change the input parameters and termination conditions and report the results, function evaluations, and convergence.
   a. $x^3 - 2x - 5 = 0$
   b. $x\ sin(x) = 1$
   c. $e^{-x} = x$

2. Solve the system of nonlinear equations using Newton's method for different input parameters. Report the results, function evaluations and convergence.

   a. $$16x_1^4 + 16x_2^4 + x_3^4 = 16$$
   $$x_1^2 + x_2^2 + x_3^2 = 3,$$
   $$x_1^3 - x_2 = 0.$$

   Consider the initial point as $(1,1,1)^T$.

   b. $$x_1 + 10x_2 = 0,$$
   $$\sqrt{5}(x_3 - x_4) = 0,$$
   $$(x_2 - x_3)^2 = 0,$$
   $$\sqrt{10}\,(x_1 - x_4)^2 = 0,$$

   Consider the initial point as $(1,2,1,1)^T$.