ES-341 Numerical Analysis

Assignment No : 3

Last date for submission: Monday, 31/10/22

Q1: Write MATLAB code to find the roots of the following functions accurate to within 10^{-5} using Newton, modified Newton and Secant method. Consider the interval $[0,2]$.

$$
\begin{aligned}
a.\quad & f(x) = x^{\frac{1}{x}} - \frac{1}{5} \\
b.\quad & f(x) = e^{x} - 2^{-x} + 2\cos(x) - 6, \\
c.\quad & f(t) = (t+2)(t+1)^{2}(t-2), \\
d.\quad & f(t) = t\sin(t) - \frac{1}{2}\cos(2t), \\
e.\quad & f(t) = ln(t-1) + \cos(t-1)
\end{aligned}
$$

.

P.S: You can take help from following algorithm to create the logic for code.

Newton's

To find a solution to $f(x) = 0$ given an initial approximation p_0:

INPUT initial approximation p_0; tolerance TOL; maximum number of iterations N_0.

OUTPUT approximate solution p or message of failure.

Step 1 Set $i = 1$.

Step 2 While $i \le N_0$ do Steps 3–6.

Step 3 Set $p = p_0 - f(p_0)/f'(p_0)$. (*Compute* p_i.)

Step 4 If $|p - p_0| < TOL$ then
OUTPUT (p); (*The procedure was successful.*)
STOP.

Step 5 Set $i = i + 1$.

Step 6 Set $p_0 = p$. (*Update* p_0.)

Step 7 OUTPUT ('The method failed after N_0 iterations, N_0 =', N_0);
(*The procedure was unsuccessful.*)
STOP.

To write function in MATLAB:

```
syms x; %to treat x as variable in MATLAB otherwise values of x will be required
f(x)=cos(exp(x)-2)-exp(x)+2;
f1(x)=diff(f(x),x); %derivative of f(x)
```