Complete within two working days Date: 22/02/2022

Assignment 04

Second Year BS (Honours) 2020-2021
Course Title: Math Lab II (Fortran), Course Code: AMTH 250
Department of Applied Mathematics, University of Dhaka

Name: **Roll No:** **Group:**

*[Write a FORTRAN program to solve each of the following problems. **Use files for input/output unless specified otherwise**. Name the files and the code according to the assignment and problem no., e.g., for problem no. **Y** of assignment **X**, input & output file names must be 'in**X**q**Y**.txt' and 'out**X**q**Y**.txt' respectively.]*

	Day-1	
1.	Consider the function $f(x) = 1.5x^3 - 7x - 1 - e^x$. Determine an approximation to the zero of this function that is accurate to within 10^{-6} using the Bisection Method. Use the endpoints of the interval $[-2,0]$ as the starting points and follow the stopping criteria as $\frac{\lvert P_n - P_{n-1}\rvert}{\lvert P_n \rvert} < TOL$, where P_n is the n^{th} approximation and TOL is the tolerance. Show your answer in a table with headings as follows: Iteration No., a, b, P_n, $\frac{\lvert P_n - P_{n-1}\rvert}{\lvert P_n \rvert}$.	**[10]**
2.	Use the Fixed-Point Iteration method to determine an approximation to the root of the equation $-2^{-x} + x^3 - \frac{1}{2}x^2 + x = 0$ on $[0,1]$ that is accurate to within 10^{-3}. Take $g(x) = 2^{-x} - x^3 + \frac{1}{2}x^2$. Show your answer in a table with headings as follows: Iteration No., P_{n-1}, P_n, $f(P_n)$.	**[10]**
3	The equation $16x^4 + 88x^3 + 159x^2 + 76x - 240 = 0$. To approximate a root, use the Newton-Raphson method with initial guess i. $x_0 = -4$ ii. $x_0 = 1$ iii. $x_0 = -2$ Iterate until an accuracy of 10^{-5} (if possible) is obtained. Show your answer in three different tables – each containing headings as follows: Iteration No, P_{n-1}, $f'(P_{n-1})$, P_n, $f(P_n)$.	**[10]**

 Total Points: 70

Day-2

4. Let $f(x) = 230x^4 + 18x^3 + 9x^2 - 221x - 9$, then approximate the zero to within 10^{-6} using the Method of False Position on [0,1]. Show your result in a table with appropriate headings. **[10]**

5. The population of a country from the year 1860 to the year 2020 is given in the following table : **[15]**

Year	1860	1880	1900	1920	1940	1960	1980	2000	2020
Population (millions)	249	277	316	350	431	539	689	833	1014

Construct Newton's forward difference table, and then calculate the population in the year 2018.

6. Let the data set is given as **[15]**

X	20	40	60	80	100	120	140	160
Y	10	50	109	180	300	420	565	771

Construct Newton's backward difference table, and then calculate $Y(15)$ and $Y(30)$