National University of Modern Languages, Islamabad
Faculty of Engineering & Computer Science
Department of Computer Science

Numerical Computing

Final Term Exam **25th June 2021** **Time allowed: 2 hours**

Maximum Marks: 30 **Lecturer: Dr. Muhammad Mohsin**

Instructions*: Solve all of the following questions and think carefully before you answer. Make sure that you write your name and roll number clearly on your answer sheets, keep your camera on and be honest during the entire exam. Once you complete the exam, submit your answer sheets as a single pdf file on LMS within 20 minutes. If you cannot submit your pdf answer sheet on LMS, send it to me via email within the given time. My email address is muhammad.mohsin@numl.edu.pk*

Q. 1 (a) A computer scientist wants to solve a non-linear equation that has a given continuous function and a given closed interval. He does not get opposite signs of the function at the extreme end points of the interval. Which numerical method would you like to recommend for the scientist to use? Explain your answer with clear reasons. [6 marks]

(b) What is the most important similarity and difference between

(i) Bisection and Regula-Falsi methods. [2 marks]

(ii) Newton-Raphson and Secant methods. [2 marks]

Q. 2. Apply the trapezoidal, Simpson 1/3 and Simpson's 3/8 rules to the following definite integral

$$I = \int_1^2 x^6 \, dx$$

and calculate the absolute error in each case. [6 marks]

(b). What did you notice after applying these three rules? [4 marks]

Q. 3. (a) Use the Newton-Raphson method to solve the following non-linear equation

$$x = \tan(x)$$

up to 3 decimal places. (Make sure that your calculator is in Radian mode.)
Take the initial approximation as

(i) 4.
(ii) 4.6. [6 marks]

(b) What did you notice from these two cases? Explain clearly. [4 marks]

End of Exam.