Student ID:

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

Quiz no. 1 | Summer Semester 2020-2021

DURATION: 30 MIN | FULL MARKS: 15

Math 4641: Numerical Methods

Figures in the right margin indicate marks.

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1. i) When we use a calculator to find the square root of a positive number R, then the calculator actually performs some sort of numerical method to find it. One such method is the **Newton-Raphson** method. Prove that the **Newton-Raphson** equation for finding the square root of R is: **3**

$$X_{i+1} = \frac{1}{2}(X_i + \frac{R}{X_i})$$

ii) Suppose you are trying to find the square root of **10**. If you directly use your calculator, you will get the result as **3.16228**. Simulate how the calculator will find this value by using Newton-Raphson method for at least **3** iterations taking an initial guess of $X_0 = 5$. Show the absolute relative approximate error at every iteration. **4**

2. What are the different ways truncation error may be introduced? **2**

3. Calculate the approximate derivative of $\frac{e^x}{1+x}$ using h=0.02 and h=0.01 and find the absolute relative approximate error. How many significant digits can you trust in this approximate solution? **4**

4. Explain how the False Position method improves over the Bisection method. **2**