Student ID:

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

Quiz no. 2 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. Differentiate between the solution approaches of Direct, Newton's Divided Difference and Lagrangian Interpolation. 4

2. Suppose you are given n data points and you are trying to perform **Linear interpolation** at an unknown arbitrary point x. For Linear interpolation, you would need to choose two closest data points to x from the n given points so that these two points bracket the point x. Suppose these two points and their corresponding functional values are $(x_0, f(x_0))$ and $(x_1, f(x_1))$. 5
Now, if you wanted to perform the interpolation using Direct method, you would need to build a polynomial solving the unknown terms a_0 and a_1. Similarly, if you wanted to do the same task using Newton's Divided Difference method, then you would need to solve b_0 and b_1. Derive these parameters for each of the cases separately for linear interpolation. Also, show how you can get the parameters of Direct method from the parameters of Newton's Divided Difference method.

3. The upward velocity of a rocket is given as a function of time according to the following table: 6

	T (s)	V(t) (m/s)
x_0	0	0
x_1	10	227.04
x_2	15	362.78
x_3	20	517.35
	22.5	602.97
	30	901.67

Determine the velocity of the rocket at $t = 11$ seconds using 3rd order (cubic) Lagrangian polynomial interpolation. Also find the acceleration of the rocket at $t = 11$ as well as the distance travelled by the rocket from $t = 10$ to $t = 14$.