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Department of Computer Science & Engineering

Mid Term Examination Spring 2024

CSE 4745 Numerical Methods

Total Marks: ***30*** Time: ***90*** Minutes

[Answer ***all*** the ***three*** questions. Figures in the right-hand margin indicate full marks.]

1.a)	Draw the *block diagram* of the process of numerical computing.	1.5	CO1	C1
b)	Write short notes on (any two): i) Conversion errors ii) Truncation errors iii) Modelling Errors	2	CO1	C2
c)	Describe the *banker's rounding rule*. Use *banker's rounding rule* to round off the following numbers to four significant figures - **i) 38.46735 ii) 0.700156 iii) 0.0022213 iv) 19.245101**	4	CO2	C3
d)	What do you mean by *absolute error* and *relative error*? If **X = 0.0610958** is rounded off to four significant figures compute the absolute error and relative error in **X**.	2.5	CO2	C3
2.a)	What is *Horner's rule*? Evaluate the polynomial $\mathbf{f(x) = x^5 - 4x^4 - 7x^3 + 11x - 13}$ using Horner's rule at **x = M**. [**M** means the *last digit* of your ID number]	2	CO2	C2
b)	Find the root of the equation $\mathbf{x^3 - x - 1 = 0}$, correct to two decimal places, by using the ***bisection*** *method.* ***OR*** Find the root of the equation $\mathbf{2x^3 - 2x - 5 = 0}$, correct to two decimal places, by using the ***secant method*** *method.* [***secant*** *formula:* $x_{n+1} = x_n - ((f(x_n) * (x_n - x_{n-1})) / (f(x_n) - f(x_{n-1})))$]	5	CO2	C3
c)	Derive the ***Newton – Raphson formula***. Write the limitations of Newton - Raphson method.	3	CO1	C2
3.a)	Find the missing term in the following data using *Newton's Binomial Expansion formula.* **x 1 2 3 4 5** **y 2 5 ? 10 15**	2	CO4	C3
	Derive the *Newton's forward interpolation formula.* ***OR*** Derive the ***Lagrange's Interpolation formula.***	4	CO3	C2
c)	Using a *suitable interpolation formula*, determine the population of a town in **1895** [if the *last digit* of your ID is **odd**] / **1936** [if the *last digit* of your ID is **even**], with the help of the following data.	4	CO4	C3

year	**1891**	**1901**	**1911**	**1921**	**1931**	**1941**
population (in millions)	**46**	**66**	**81**	**93**	**101**	**125**