



Course:	Numerical Computing	Course Code:	CS2008
Program:	BSCS/BSR/BSSE	Semester:	Fall 2023
Duration:	60 min	Total Marks:	40
Paper Date:	November 10, 2023	Weight	15%
Section:	All	Page(s):	1
Exam:	Sessional - II	Roll No:	

Instruction/Notes: Attempt All Questions

Q1. Approximation to the integral $\int_0^1 f(x) dx$, using Simpson's rule with step sizes $h = 0.25$, $\frac{h}{2} = 0.125$ are $I_h = 0.632134175$, $I_{\frac{h}{2}} = 0.632121415$ respectively. Use Romberg Integration based on Simpson rule to find $O(h^6)$ approximation Points (5)

Q2. Find the minimum number of iterations N , needed to achieve an accuracy of 1×10^{-5} by using the bisection method. Points (5)

$$f(x) = e^x - 1 - x - \frac{x^2}{2} \quad \text{in } [-1, 1].$$

Note: Find N without solving $f(x) = 0$ for x .

Q3. Show that order of convergence of Newton - Raphson method is 2. Points (10)

Q4. Derive an algorithm to compute $\sqrt[m]{K}$ (where m and K are positive integer) based on Newton Raphson method, and apply your algorithm to compute $\sqrt[3]{25}$ till three decimal places by choosing a suitable initial guess. Points (10)

$$U = I$$

Q5. Solve the following linear system using Crout's Method. Points (10)

$$\begin{bmatrix} 3 & 1 & -1 \\ -1 & 2 & 8 \\ 1 & -5 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 8 \\ -8 \\ -4 \end{bmatrix}$$