COMSATS University Islamabad
Abbottabad Campus

Department of Mathematics
Terminal, 2025

Subject: Numerical Computation
Class: BCS-7C, BSE-8A
Time Allowed: 3 Hours
Name: _____

Instructor: Shamsul Haq
Date: 19-07-2025
Marks: 60
Reg #: _____

Note: Attempt all the question with clear and necessary steps. All questions carry equal marks.

Question No 1: Write the difference between

a. Interpolation and extrapolation.
b. Jacobi's Iterative method and Guass Seidal iterative method.
c. Trapezoidal rule and Simpson 1/3 rule.
d. Euler's method and Improved Euler's method.
e. l_2 and l_∞ norm.

Question No 2: Construct a Backward difference table for the following values of x and y. Estimate y if $x = 0.55$.

x	0.1	0.2	0.3	0.4	0.5	0.6
y	0.5	1.2	2.5	3.8	4.3	6.9

Question No 3: Solve the differential equation $\frac{dy}{dx} = \sqrt{x} - y^2$, with initial condition $y(0) = 1$ in $[0,1]$, using the RK-4 method for $N = 2$.

Question No 4: Find the approximate value of $I(x) = \int_0^{\pi} (x^3 + 6x^2 - 9x)dx$ using Trapezoidal and Simpson's 1/3 rule for $N = 6$. Compare your answer with exact value of the Integral.

Question No 5: Construct the Divided difference table and use newton divided difference formula to find interpolation polynomial for the data given below, also dind $y(8.5)$.

X	1	5	8	9	11	13
Y	0.5	1.2	2.5	3.8	4.3	6.9

Question No 6: Find the relative error $\frac{\|X^{(4)} - X^{(3)}\|_\infty}{\|X^{(4)}\|_\infty}$ in the solution of the following System of linear equations using Gauss-Seidel method, assuming $X^{(0)} = (0,0,0)^t$.

$$12x_1 - x_2 = 9$$
$$-x_1 + 8x_2 - 2x_3 = 7$$
$$-2x_2 + 10x_3 = 6$$

-:(Good Luck):-