Daffodil International University

Faculty of Science & Information Technology

Final Examination, Spring 2023

Course Code: CSE235 Course Title: Numerical Methods

Level and Term: L2T2 & L3T1 Batch: 60 & 59

Time: 2:00 Hrs **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1. ***a)*** **Solve** the following system of linear equations using the Gauss-Seidel method: **[7] CO2**

$$3x + y + z = 4$$
$$x + 4y + z = 1$$
$$2x + y + 5z = 9$$

Use an initial guess of $x_0 = y_0 = z_0 = 0$ and iterate until the solution converges to three decimal places.

b) **Apply** Gauss Elimination method to solve the following system of linear equations: **[7] CO2**

$$x + y + z = 1$$
$$3x + y - 3z = 5$$
$$x - 2y - 5z = 10$$

2. ***a)*** **Evaluate** the value of y at x = 1.85 from the following table using Newton forward interpolation method. **[7] CO3**

x	1.8	1.9	2.0	2.1	2.2
$y = e^x$	6.050	6.686	7.389	8.166	9.025

b) **Solve** the following first-order ordinary differential equation using the 4th order Runge-Kutta method: **[7] CO3**

$$y' = -y^2 + 4x$$

with initial condition $y(0) = 2$. Find the value of y when $x = 0.4$ with step size $h = 0.2$

3. ***a)*** **Evaluate** the value of $\int_{0.2}^{1.4}(sinx - lnx + e^x)$ correct to four decimal places using eight equal parts by Simpson's 3/8 rule. **[6] CO3**

b) **Estimate** the best values of a_0, a_1, a_2 so that the parabola, $y = a_0 + a_1x + a_2x^2$ fits the data: **[6] CO3**

x	1.0	1.5	2	2.5	3.0	3.5	4.0
y	1.1	1.2	1.5	2.6	2.8	3.3	4.1