



Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Mid-Term Examination, Spring 2026

Course Code: MAT101, Course Title: Mathematics I

Level: L1 Term: T1 Batch: 71

Time: 01:30 Hrs

Marks: 25

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)	Classify the Relation is an Injective, Surjective, and Bijjective Function:	2	
	i)			
	ii)			
	iii)			
	b)	Demonstrate the Differentiability of the following function at the point $x = 0$ $f(x) = \begin{cases} x^2 \sin\left(\frac{1}{x}\right); & x \neq 0 \\ 0; & x = 0 \end{cases}$	3	CO1
	c)	Explain function with example. If $f(x) = \ln x; x \geq 0$ then Demonstrate the inverse of $f(x)$. $\therefore \frac{d}{dx}(\ln x) = \frac{1}{x}$	2	
2.		Demonstrate the solution of the inequality $\frac{x^2 - 4x + 4}{x^3 + 8x^2 + 15x} \geq 0$ using sign table.	3	CO1
3.		State the Factor Theorem. Apply the Remainder Theorem to solve the following polynomial equation $2x^4 + 6x^3 - 2x^2 - 39x - 18 = 0$ $2 \cdot 1^4 + 6 \cdot 1^3 - 2 \cdot 1^2 - 39 \cdot 1 - 18 = 0$	5	CO2
4.	a)	Inspect the rate of change of y with respect to x , or $\frac{dy}{dx}$ of the function $(\cos x)^y = (\sin y)^x$.	3	CO3
	b)	A bike rider riding a bike on a hill road, if the equation of path is $y = x^2 10^x \sin x + (x)^{e^{\ln x}}$ then, Inspect the slope of the path at $x = 2$	4	
	c)	If $y = \sin^{-1}(\cos(e^{\ln x}))$ and $z = \ln(x + \sqrt{x^2 + 1})$ then, Inspect the rate of change of z with respect to y , or $\frac{dz}{dy}$.	3	

$$2x^4 - 6x^3 + 12x^2 - 36x - 3x + 9 = 0$$

$$2x^2(x-3) + 12x(x-3) - 3(x-3) = 0$$

$$(x-3)(2x^2 + 12x - 3) = 0$$