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Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Mid-Term Examination, Fall 2025
Course Code: MAT101, Course Title: Mathematics I
Level: 1 Term: 1 Batch: 70

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)	Define function with example. If $f(x)=\sqrt{2x+1}$ then Demonstrate the inverse of $f(x)$.	3	CO1
	b)	Demonstrate the Differentiability of the following function at the point $x=\frac{\pi}{2}$ $$f(x)=\begin{cases}2+\sin x; x<0\\ 1+\cos x; 0\le x<\frac{\pi}{2}\\ 1+\left(\frac{\pi}{2}-x\right); x\ge\frac{\pi}{2}\end{cases}$$	4	
2.		Find the solution of the inequality $\frac{x^2+8x+15}{x^3-14x^2+40x}\ge 0$ using sign table.	3	CO1
3.		State the Remainder Theorem. Apply the Remainder Theorem to solve the following polynomial equation $x^6-14x^4+11x^3+12x^2=0$	5	CO2
4.	a)	If $y=\sin\left(e^{\ln(\sin^{-1}x)}\right)$ and $z=(\sin x)^{x^2}$ then examine the rate of change of z with respect to y or $\frac{dz}{dy}$.	3	CO3
	b)	If $y=a^x+\log x+\ln x+\log_a x+\cos ec^{-1}x+e^{3x}$ then inspect the rate of change of y with respect to x, or $\frac{dy}{dx}$.	3	
	c)	A stone is rolling down an inclined plane, and its path is given by $y=\sec^{-1}\left(\frac{1+t^2}{1-t^2}\right)+\tan^{-1}\left(\frac{\cos t}{1+\sin t}\right)$ Then, inspect the slope of the path at $t=0.5$.	4	