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Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Midterm Examination, Summer 2026
Course Code: MAT101, Course Title: Mathematics I
Level: L1 Term: T1 Batch: 72

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)	Demonstrate the Continuity and Differentiability of the following function at the point $x=0$ $f(x)=\begin{cases} e^x-1; x<0 \\ \sin x; 0\le x\le \pi \\ x-\pi; x>\pi \end{cases}$	4	CO1
	b)	If $y=\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\ldots\ldots}}}}$ then demonstrate the value of y.	3	
2.		Interpret the solution of the inequality $\frac{x^2+x}{x^2-4x-45}\le 0$ using sign table.	3	CO1
3.		To determine the exact time complexity of the algorithm, the engineer derives the following characteristic polynomial equation: $x^4-3x^3-7x^2-13x-10=0$ Where the largest real root x, represents the growth factor of the algorithm's execution time. Apply the Factor Theorem for Solving this equation to find the growth factor.	5	CO2
4.	a)	Inspect the rate of change of y with respect to x, or $\frac{dy}{dx}$ of the function $y=e^{-3x}+\log_a x+\sec^{-1}x+\operatorname{cosec}5x+a^x+\sec x$.	3	CO3
	b)	A motorcycle moves along a hill road. If the equation of the path is $y=\ln\sqrt{\frac{1-\cos x}{1+\cos x}}+\left(\ln e^x\right)^x$ then, inspect the slope of the path at $x=0.5$	4	
	c)	If $y=\sin\left(\sin^{-1}\left(\cos\left(\sec\left(\sqrt{1+x^2}\right)\right)\right)\right)$ and $z=10^{\ln(\sin x+\sec x)}$ then, Inspect the rate of change of z with respect to y, or $\frac{dz}{dy}$.	3	