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Daffodil International University

Faculty of Science & Information Technology
Department of Software Engineering
Midterm Examination, Summer 2025
Course Code: MAT101
Course Title: Mathematics I
Batch: 44; Section: A-L
Teachers Initial: MMH, DMMK, MIA, GRS

Time: 1 Hour 30 Minutes **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.	**Explain** the following with a suitable example **a.** Relation **b.** Bijective Function **c.** Homogeneous Function	3×1=3	
2.	(a) **Compute** the domain and range of the following function $f(x) = \frac{2x^2 + 3x + 17}{x^2 - x - 2}$	3	CLO-1 L-2
	(b) **Express** the following function graphically and write a comment on its domain and range from the graph $f(x) = \lvert x - 2\rvert - \lvert x + 3\rvert + \lvert x\rvert$	4	
3.	(a) **Calculate** the non-zero value of k that makes the following function continuous at $x = 0$, then also determine whether the function is differentiable or not at the same point by using the non-zero value of k $f(x) = \begin{cases} \frac{\tan kx}{x}, & x < 0 \\ 3x + k^2, & x \geq 0 \end{cases}$	5	CLO-2 L-3
	b. If $u = \tan^{-1}\left(\frac{y+x}{\sqrt{y}+\sqrt{x}}\right)$ then **show** that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{4}\sin 2u$	4	
	c. **Compute** the derivative of $x^{\sin(\ln(\tan^{-1}\sqrt{ax}))}$ with respect to $a^{bx}\sin^m(rx) + a^m$	3	
	d. If $y = \ln(a^n x + b^n)$ then **calculate** the *n-th* derivative (y_n) of y	3	