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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 $y=\ln(a^nx+b^n)$ then **calculate** the *n-th* derivative (y_n) of y	3	