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Daffodil International University

Faculty of Science & Information Technology
Department of Computing and Information System
Final Examination, Summer-2026
Course Code: MAT101, Course Title: Mathematics I
Level: 1 Term: 2

Exam Duration: 2 Hours **Marks: 40**

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** proper and improper fractions with examples.	[2]	CO2
	b)	**Express** the following fractions as partial fractions: i) $\frac{7x-13}{(x-3)(x+1)}$ ii) $\frac{2x^2+x+1}{x^2+2x-3}$	[2] [4]	
2.	*a)*	**Calculate** the derivative of the following functions: i) $y = -2\sec x + 3e^{-2x} + 5$ ii) $y = (\sin x)^{\cos x}$	[1] [3]	CO3
	b)	A garden is to be laid out in a rectangular area and protected by a wire fence. Only 200 running feet of wire is available for the fence. i) **Derive** the area function of the rectangular garden and **calculate** critical points. ii) **Determine** the height and width of the garden such that the area of the garden is maximum.	[3] [3]	
3.	*a)*	**Calculate** the following integrals: i) $\int_1^2 2x^2(x^3+2x^2-3)dx$ ii) $\int x\tan^{-1}(x)\,dx$	[3] [4]	CO4
	b)	**Calculate** the area of the circle $4x^2 + 4y^2 = 36$ using integration.	[5]	
4.	*a)*	i) **Define** the divergence of a vector field. ii) If $\phi(x,y,z) = 4x^2y^2 - 3yz^3$, **calculate** $\vec{\nabla}\phi$ at the point $(1,-2,1)$.	[1] [5]	CO4
	b)	i) **Define** the dot product and the cross product. ii) **Compute** the value of a such that $\vec{A} = 2\hat{\imath} + a\hat{\jmath} - 3\hat{k}$ and $\vec{B} = \hat{\imath} - 2\hat{\jmath} - 3\hat{k}$ are perpendicular.	[2] [2]	