



Daffodil International University
Faculty of Science & Information Technology
Department of Computer Science & Engineering
Final Examination, Summer 2025
Course Code: MAT101, Course Title: Mathematics I
Level: 01 Term: 01 Batch: 69

Time: 02:00 Hrs

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)	Construct the following rational fraction into the partial fraction $\frac{2x^3}{x^2 - x - 30}$	4	CO2
	b)	Construct the following rational fraction into the partial fraction $\frac{x-2}{(x^2+1)(x-3)^2}$	6	
2.		A manufacturer produces a certain product, and the profit (in thousands of dollars) from selling x units of the product is modeled by the function: $f(x) = 4x^5 - 5x^4 - 20x^3 + 50x^2 - 40x$ Where x represents the number of units (in hundreds) sold. - List the critical points of the profit function. - Examine the maximum and minimum profit values using the derivative test.	5	CO3
3.	a)	Simplify the following integrals (i) $\int \frac{2x^3}{18x + 2x^3} dx$ (ii) $\int e^{-4x} \cos 3x dx$	5+5	CO4
	b)	Consider the circle given by the equation $x^2 + y^2 = a^2$ and the vertical line $y = c$ ($-a < c < 0$). Examine the largest area of the region bounded by the circle and the line.	5	
	c)	Examine the total accumulated value of $f(x) = \frac{\cos^3 x}{\sin x + \cos x}$ from $x = 0$ to $x = \frac{\pi}{2}$	5	
4.		Assume the Scalar $\varphi(x, y, z) = x^3 y - y^3 z + z^3 x$ then conclusion that $\nabla \cdot (\nabla \varphi) = \nabla^2 \varphi$.	5	