



Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Final Semester Examination, Spring 2025

Course Code: MAT101, Course Title: Mathematics I

Level: 1 Term: 1 Batch: 68

Time: 2:00 Hrs

Marks: 40

Answer ALL Questions [Optional]

[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 $\frac{61x-45}{(x^2+2)(x+3)^2}$	[6]	CO2
	b)	Construct the following rational fraction into the partial fraction $\frac{x^3-5}{x^2-11x+30}$	[4]	
2.	a)	A manufacturer produces a particular product, and the profit (in thousands of dollars) from selling x units of the product is modeled by the function: $f(x) = 4x^5 - 20x^4 + 20x^3 + 20$ $\left(\begin{matrix} \text{max} & \text{min} \\ 24, & -88 \end{matrix} \right)$ Where x represents the number of units (in hundreds) sold. 1. List the <u>critical points</u> of the profit function. 2. Examine the <u>maximum</u> and <u>minimum</u> profit values using the derivative tests. 3. Analyze the results in terms of business decisions: i. At what production level does the company achieve <u>maximum</u> profit? ii. Are there any production levels where the company incurs the <u>least</u> profit?	[5]	CO3
3.	a)	Simplify the following integrals (i) $\int \frac{1}{x^2+4x+20} dx$ (ii) $\int \frac{1}{1+\cos^2 x} dx$ $\sin 2A$ (iii) $\int_0^{\pi/2} \frac{1}{1+\sqrt{\tan x}} dx$	[5] [5] [5]	CO4
	b)	Consider the ellipse given by the equation $9x^2 + 16y^2 = 144$ and the vertical line $x = 2$. Examine the largest area of the region bounded by the ellipse and the line.	[5]	
4.		Assume $\phi = 2x^2y^2z^3 + 20$ then inspect the value of $\nabla \times (\nabla \phi)$. $\Rightarrow 0$	[5]	