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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: $f(x)=4x^5-20x^4+20x^3+20$ Where x represents the number of units (in hundreds) sold. 1. List the critical points of the profit function. 2. Examine the maximum and minimum profit values using the derivative tests. 3. Analyze the results in terms of business decisions: i. At what production level does the company achieve maximum profit? ii. Are there any production levels where the company incurs the least profit?	[5]	CO3
3.	a)	Simplify the following integrals (i) $\int \frac{1}{x^2+4x+20}dx$	[5]	CO4
		(ii) $\int \frac{1}{1+\cos^2 x}dx$	[5]	
		(iii) $\int_0^{\pi/2} \frac{1}{1+\sqrt{\tan x}}dx$	[5]	
	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 $\varphi=2x^2y^2z^3+20$ then inspect the value of $\nabla\times(\nabla\varphi)$.	[5]	