



Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science and Engineering

Midterm Examination, Spring-2025

Course Code: MAT 102, Course Title: Mathematics II

Level: 01 Term: 02 Batch: 67

Time: 1.5 Hours

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.	a)	Demonstrate the exact value of the integral $\int_0^{\infty} 5x^4 e^{-2x^2} dx$ by using techniques involving the Gamma function.	[3]	CO1
	b)	Illustrate β - Γ function to calculate the exact value of $\int_0^1 \frac{x}{\sqrt[3]{1-x^2}} dx$.	[3]	
	c)	Demonstrate the value of $\int_0^{\pi/2} 6 \sin^8 \theta d\theta$. 1890π	[2]	
Note: In all cases of Question 1, express your answers as fractions, not decimals.				
2.	a)	In a computational model, the cost function is given by $C(x, y, t) = \ln(\sqrt{x + y - t^2}) + e^{-yt} - \cos^2(3x + 2y),$ where x is CPU usage, y is memory allocation, and t is execution time. Identify C_{xy} and C_{yt} to analyze their impact on system optimization.	[3]	CO2
	b)	Apply Euler's theorem for the function $u = \cos^{-1}\left(\frac{x+y-\sqrt{xy}}{x^3+y^3+z^3}\right)$ to show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = \frac{2}{\tan u}.$	[4]	
3.		Evaluate $\iiint_V xy^2 z^3 dx dz dy$, where V is the region of space defined by $V = \{(x, y, z) : z^2 \leq x \leq y, 0 \leq y \leq 2, \sqrt{y} \leq z \leq 1\}.$	[5]	CO4
4.		Construct the matrix form of the complex number $z = (-2 + 5i)^8 - 7.5(4.9, 230^\circ)$	[5]	CO2