



# Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Mid-Term Examination, Fall 2025

Course Code: MAT 102, Course Title: Mathematics II

Level: 01, Term: 02, Batch: 69

Time: 01:30 Hrs

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)	Find the values of the following integration by using Gamma function, $\int_0^{\infty} e^{-20x^2} x^5 dx$	[02]	CO1
	b)	Find the values of the following integration by using Gamma-Beta function, $\int_0^{\frac{\pi}{2}} \sin^7 \theta d\theta$	[02]	
	c)	Interpret the value of the following integration by using Gamma-Beta function, $\int_0^1 \left( \sqrt[3]{x^2} - 1 \right)^6 dx$	[04]	
2.	a)	In a computational model, the cost function is given by $C(x, y, t) = \cot^{-1} \left( \frac{(\sqrt[3]{x} - \sqrt[3]{y} - \sqrt[3]{t})^2}{\sqrt[3]{x^2} - \sqrt[3]{y^2} - \sqrt[3]{t^2}} \right)$ Where $x$ is CPU usage, $y$ is memory allocation, and $t$ is execution time. Now, <b>Apply</b> Euler's theorem to <b>Identify</b> the value of $x \frac{\partial C}{\partial x} + y \frac{\partial C}{\partial y} + t \frac{\partial C}{\partial t}$ to analyze their impact on system optimization.	[05]	CO2
	b)	Construct the Matrix form of the complex number $Z = \frac{Z_1}{2Z_2} + Z_3 - Z_4$ , where $Z_1 = (1-i)^2$ ; $Z_2 = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ ; $Z_3 = \left( \sqrt{2}, \frac{\pi}{4} \right)^{13}$ ; $Z_4 = e^{\frac{i\pi}{9}}$	[07]	
3.		Solve the triple integral $\int_1^e \int_1^e \int_1^e \frac{3}{xyz} dx dy dz$	[05]	CO4