



# Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science and Engineering

Midterm Examination, Summer-2025

Course Code: MAT 102, Course Title: Mathematics II

Level: 01 Term: 02 Batch: 68

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 value of $\int_0^{\infty} 25 e^{-18x^2} x^{6-1} dx$ .	[3]	CO1
	b)	Illustrate $\beta$ - $\Gamma$ function to find the value of $\int_0^1 \frac{x^{\frac{2}{3}}}{\left(\sqrt{1-x^3}\right)^{-7}} dx$ .	[3]	
	c)	Extend the matrix A as the sum of a symmetric and a skew symmetric matrix. Where, $A = \begin{pmatrix} 2 & 4 & -6 \\ 1 & 7 & 0 \\ 5 & -2 & 8 \end{pmatrix}$ .	[3]	CO1
2.	a)	Identify the value of $M_{xy}$ and $M_z$ . Where, $M(x, y, z) = e^{xy}(\cos z) - \ln(xz)$ .	[2]	CO2
	b)	Apply Euler's theorem for the function $u = \cot^{-1}\left(\frac{\sqrt{x}-\sqrt{y}+\sqrt{z}}{\sqrt{x^2}-\sqrt{y^2}+\sqrt{z^2}}\right)$ to show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = -\frac{1}{20} \sin 2u$ .	[4]	
3.		Construct the Matrix form of, $Z = 10Z_1 + (Z_2)^6 - 9Z_3$ . where, $Z_1 = e^{4.5i}$ , $Z_2 = (-4 + 7i)$ and $Z_3 = (3.6, 250^\circ)$ .	[5]	CO2
4.		Evaluate the total mass of a gas contained within a cuboidal chamber V, which is bounded by $(2 \leq x \leq e^2)$ , $(-1 \leq y \leq 3)$ , and $(1 \leq z \leq x^2)$ . The density of the gas varies throughout the chamber and is described by the function, $V = \iiint \left(\frac{y^2 z}{x}\right) dy dz dx$ . Where, $(x, y, z)$ are the spatial coordinates inside the chamber.	[5]	CO4

$$\frac{7}{6} e^{14} + \frac{14}{3} \ln 2 - 28$$

$$2.3453$$