



# 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 $\int_0^1 \frac{x^{\frac{2}{3}}}{\left(\sqrt{1-x^{\frac{1}{3}}}\right)^{-7}} dx$ .                                                                                                                                                                                                                                            | [3] |     |
|    | c) | Extend the matrix A as the sum of a symmetric and a skew symmetric matrix.<br>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,<br>$M(x, y, z) = e^{xy}(\cos z) - \ln(xz)$ .                                                                                                                                                                                                                                                                                            | [2] | CO2 |
|    | b) | Apply Euler's theorem for the function $u = \cot^{-1} \left( \frac{\sqrt{x}-\sqrt{y}+\sqrt{z}}{\sqrt[5]{x^2}-\sqrt[5]{y^2}+\sqrt[5]{z^2}} \right)$ to show<br>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, $Z = 10Z_1 + (Z_2)^6 - 9Z_3$ .<br>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,<br>$V = \iiint \left( \frac{y^2 z}{x} \right) dy dz dx$<br>Where, (x, y, z) are the spatial coordinates inside the chamber. | [5] | CO4 |