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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 β-Γ 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. 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, $M(x,y,z) = e^{xy}(cosz) - \ln(xz)$.	[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 that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = -\frac{1}{20} sin2u$.	[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 $Z_3 = (3.6, 250°)$.	[5]	CO2
4.		Evaluate the total mass of a gas contained within a cuboidal chamber V, which is bounded by $(2 \le x \le e^2)$, $(-1 \le y \le 3)$, and $(1 \le z \le x^2)$. The density of the gas varies throughout the chamber and is described by the function, $V = \iiint (\frac{y^2 z}{x}) dydzdx$. Where, (x, y, z) are the spatial coordinates inside the chamber.	[5]	CO4