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Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science and Engineering

Midterm Examination, Summer-2026

Course Code: MAT 102, Course Title: Mathematics II

Level: 01 Term: 02 Batch: 71

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 $\int_0^{\frac{\pi}{2}} \sqrt{sin^{11}\theta \ cot\,\theta}\, d\theta$.	[2]	CO1
	b)	Illustrate β-Γ function to find the value of $\int_0^1 \frac{\left(\sqrt{1-x^{\frac{2}{3}}}\right)^5}{\sqrt[3]{x^{-5}}}\, dx$.	[3]	
	c)	Demonstrate the value of $\int_0^{\infty} 13\, e^{-32x^2} x^7\, dx$.	[2]	
2.	a)	Identify the value of Q_{xz}. Where, $Q(x, y, z) = 2z\, sin^2(xy) - ln\,(\frac{x}{z})$.	[2]	CO2
	b)	Apply Euler's theorem to show that $x\frac{\partial w}{\partial x} + y\frac{\partial w}{\partial y} + z\frac{\partial w}{\partial z} + u\frac{\partial w}{\partial u} = \frac{1}{4} cot\, w$ for the function $w(x, y, z, u) = cos^{-1}\left(\frac{\sqrt{x-2y+3z+2u}}{\sqrt[4]{x^3}-\sqrt[4]{y^3}+\sqrt[4]{z^3}+\sqrt[4]{u^3}}\right)$.	[5]	
	c)	Construct the Matrix form of, $Z = 10Z_1 - \frac{11}{3}Z_2 + 7\,(Z_3)^5$ where, $Z_1 = (4.2, 218°)$, $Z_2 = 2e^{3.9i}$, and $Z_3 = (4 - 7i)$.	[6]	
3.		A mathematician finds a mysterious 3D chamber which is bounded by $(0 \le x \le \ln y^2)$, $(\pi \le y \le e^2)$, and $(-1 \le z \le 3)$. To uncover the vault's secret, the mathematician must calculate the total measure of what lies within. $$V = \iiint \left(\frac{e^x z}{y^3}\right) dz dx dy$$ Solve triple integration to find the exact value of V .	[5]	CO4