Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science and Engineering

Midterm Examination, Fall-2024

Course Code: MAT 102, Course Title: Mathematics II

Level: 01 Term: 02 Batch: 66

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)	Illustrate β-Γ function to calculate the exact value of $\int_0^1 \sqrt{x}\,(1-x^2)^3\,dx$.	[3]	CO1
	b)	Demonstrate the value of $\int_0^{\pi/2} \cos^3\theta \sin^{\frac{5}{2}}\theta \, d\theta$.	[3]	
	c)	Show that $\int_0^{\infty} \sqrt{x}\, e^{-2x}\, dx = \frac{\sqrt{\pi}}{4\sqrt{2}}$.	[2]	
2.	a)	In a gaming simulation, the score S is modeled by the function $S(x,y) = \ln(x^2+y^2) + e^x\cos(y)$, where x represents the number of enemies defeated and y represents the number of levels completed. Identify the value of S_x, S_y and S_{yx}.	[3]	CO2
	b)	Apply Euler's theorem for the function $u = \sin^{-1}\left(\frac{x+2y+3z}{\sqrt{x^8+y^8+z^8}}\right)$ to show that $$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = -3\tan u.$$	[4]	
3.		Evaluate $\iiint_V (x+z)\,dydxdz$, where V is the region of space bounded by $x=0$, $x=z^2$, $y=x$, $y=z$ and $z=2$, $z=0$.	[5]	CO4
4.		Two fluids in the complex plane are represented by the vectors $z_1 = 3+7i$ and $z_2 = -4+5i$. (i) Identify the resultant fluid. (ii) Construct the resultant fluid flow vector in both polar form and exponential form.	[1+4]	CO2