Daffodil International University

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination, Spring-2024
Course Code: MAT101, Course Title: Mathematics I
Level: 1 Term: 1 Batch: 66

Time: 2 Hours **Marks: 4**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. A portions of each question must be answered sequentially.]

1.	a)	Find the decomposition of the following rational fraction into the partial fraction $\frac{x^2}{(1-x)(1+x^2)^2}$	6	CO
	b)	Find the partial fraction of the following improper fraction $\frac{3x^2+9x-20}{x^2+x-6}$	4	
2.		Identify the maximum and the minimum value of the function $f(x) = 2x^3 - 3x^2 - 12x + 5$	5	CO
3.	a)	Simplify the following integrals (i) $\int e^{ax} cosbx\, dx$ (ii) $\int sin^4 x cos^3 x dx$	5 5	
	b)	Analyze that which area will be the smallest of the region bounded by the circle $x^2 + y^2 = 25$ and the line $x = 3$, then find the smallest area.	5	CO
4.	a)	If the function $\varphi = 2x^3y^2z^4$, then examine $\nabla \cdot \nabla\varphi = \nabla^2\varphi$, where $\nabla^2 \equiv \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}$ is the Laplacian operator.	6	
	b)	If the vector $\vec{A} = x^2y\,\hat{\imath} - 2xz\,\hat{\jmath} + 3y^2z\,\hat{k}$, then simplify the curl $\vec{A}$ at the point $(2, -1, 1)$.	4	