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Daffodil International University

Faculty of Science & Information Technology
Department of Software Engineering
Final Examination, Summer 2025
Course Code: MAT101
Course Title: Mathematics I
Batch: 44; Section: A-L
Teachers Initial: MMH, DMMK, MIA, GRS

Time: 2 Hours **Marks: 40**

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.	Explain the following terms geometrically a. Saddle point b. Inflection point	2 × 2=4	CLO-1 L-2
2.	a. An open box is to be made from a 16-inch by 30-inch piece of cardboard by cutting out squares of equal size from the four corners and bending up the sides. Compute the size of the squares to obtain a box with the largest volume. b. Compute the intervals on which y is increasing and decreasing $y = 3x^4 + 4x^3 - 12x^2 - 2$ Also compute the inflection points, if any, of the above function.	5 6	
3.	Calculate the followings: a. $\int \frac{(1+x)e^x}{\cos^2(xe^x)}\,dx$ b. $\int \frac{\sin 2x}{a\sin^2 x + b\cos^2 x}\,dx$ c. $\int_0^{\frac{\pi}{2b}} e^{ax}\cos bx\,dx$ d. $\int_0^2 \int_0^z \int_0^{x\sqrt{3}} \frac{px}{x^2+y^2}\,dy\,dx\,dz$ e. $\int_0^\infty \frac{x^3}{(1+x^2)^{\frac{9}{2}}}\,dx$	5 × 3=15	CLO-2 L-3
4.	a. Identify the area of the ellipse $b^2x^2 + a^2y^2 = a^2b^2$ b. Identify the area of the region enclosed between the parabola $y = \frac{3x^2}{4}$ and the line $3x - 2y + 12 = 0$.	5 5	CLO-3 L-4