



Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Final Examination, Summer-2026

Course Code: MAT 102; Course Title: Mathematics II

Sections & Teachers: (A-O) DK, ZT, MSIM, DMMK, SST

Time: 2:00 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.	a) Explain the geometric representation of the argument of a complex number, and describe how to determine its value across all four quadrants. b) Explain the mathematical conditions required for a complex function $f(z)$ to be analytic at a specific point. c) Explain why an even periodic function's Fourier series has only cosine terms plus a constant. d) Describe the difference between the Fourier sine and cosine transforms of a function.	4 × 2	CLO-1 Level-2
2.	a) Solve the equation $z^5 + 2^5 = 0$ for all five roots, and express each in the form $a + ib$. Analyze the geometric pattern they form on the complex plane. b) Compute the principal and general arguments of z^9 where $z = -3 + 3i$. Briefly analyze why the general argument, not just the principal one, is needed to track a phase that has completed several full rotations.	4+1 4+1	CLO-2 Level-4
3.	a) Determine whether $u(x, y)$ is harmonic; if it is, construct the conjugate harmonic function $v(x, y)$, where $u(x, y)$ is given below: $u(x, y) = 2x^2 + 3x^3 - 9xy^2 - 2y^2$ b) Apply the Cauchy-Riemann equations to check whether the function $f(z) = e^{z^2}$ is analytic; if analytic, find $f'(z)$.	1+4 4+1	CLO-3 Level-3
4.	a) Calculate the infinite Fourier sine transform $f_s(n)$ of the following function: $F(x) = \begin{cases} x, & 0 \leq x < \pi \\ 0, & \pi \leq x \end{cases}$ Obtain $f_s(n)$ at $n = 1$ and $n = 2$, and briefly analyze whether the magnitude increases or decreases as n increases. b) Find the Fourier series of the function $F(x) = x^2$ on the interval $[-\pi, \pi]$. Briefly analyze what the constant term $\left(\frac{a_0}{2}\right)$ represents in the series.	5+1 5+1	CLO-4 Level-4