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Daffodil International University

Faculty of Science & Information Technology
Department of Software Engineering
Final Examination, Fall-2025
Course Code: MAT 102; Course Title: Mathematics II
Sections & Teachers: (A-K) ZT, NRA, DK, MMH

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** geometrically that the complex number is two dimensional. *b)* **Describe** the nature of the arguments of all purely imaginary numbers. *c)* **Extend the idea** of harmonic function with an example. *d)* **Describe** the Fourier series for even and odd function.	$4 \times 2 = 8$	**CLO-1** *Level-2*
2.	*a)*	**Identify** all the sixth roots of the following complex number z and locate them in the complex plane, where z is: $$z = \frac{1}{2i^3}(1-i)^2$$	5	**CLO-2** *Level-4*
	b)	**Examine** whether the following function $f(z)$ is analytic or not; if it is analytic, then identify $f'(z)$ $$f(z) = ze^{-z} + 1 \;;\; z = x + iy$$	5	
3.	*a)*	**Construct** the complex function $f(z) = u + iv$, where u is given below $$u(x,y) = \frac{1}{2}\ln(x^2+y^2) + \frac{1}{10}\ln e^{py}$$	8	**CLO-3** *Level-3*
	b)	**Compute** the polar form and exponential form of the following complex number, where z is: $$z = -1 - \sqrt{3}\,i$$	4	
4.	*a)*	A web server shows two different types of load behavior within each daily cycle. The server-load signal function $f(x)$ over one period $[-\pi, \pi]$ is defined as: $$F(x) = \begin{cases} \pi, & -\pi \le x < 0 \\ x^3, & 0 \le x \le \pi \end{cases}$$ **Detect** the Fourier series of the load signal function $F(x)$	6	**CLO-4** *Level-4*
	b)	**Identify** the Fourier cosine transform of the following function: $$F(x) = \sin(mx), \quad 0 < x < \pi$$	4	