$\frac{\pi}{6} + \pi$ $\frac{7\pi}{6}$ Date: 10 July 2024

$= \frac{7\pi}{6}$

Bangladesh Army University of Engineering & Technology (BAUET)
Department of Computer Science and Engineering
Second Year Fourth Semester (16th Batch), Summer-2024
Course Code: MATH - 2247
Course Title: Complex Variable and Laplace Transformation

## Class Test-01

Full Marks: 15   **Time: 35 Minutes**

N.B: Answer all the questions and the figures shown in the right margin indicate full marks.

			Marks	CO	PO	BL	KP
Q.	(a)	How do you indicate of absolute value of a complex number? Give one specific example of complex numbers in the engineering field. Evaluate the absolute value of a complex number defined by $$\frac{5+5i^{3.(\text{last one digit of your ID})}}{3-4i^5} + \frac{20}{4+3i} \text{ if possible.}$$	~~5~~ 6	1	1	C1 ,C 2, C5	W k1
	(b)	By employing De-Moivre's theorem, evaluate the indicated roots of $\left(-4\sqrt{3}-4i\right)^{\frac{1}{3}}$ and locate them graphically.	~~4~~ 5	1	1	C3 ,C 5	W k1
	(c)	Categorize and recommend graphically as the region in the z-plane represented by the following relation $\operatorname{Re}\left(\frac{1}{z}\right) \le \frac{1}{2}$.	~~3~~ 4	1	1	C4 ,C 5	W k1
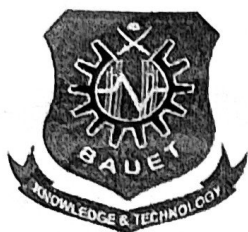
Class Test-02

Full Marks: 15

Time: 30 Minutes

N.B.: **1.** Figures shown in the right margin indicate full marks. **2.** Answer any **Three** questions **including Q.1 & Q.3**.

Q.1 What do you understand by analytic function? **2**

Q.2 Analyze the nature of the function $v = 3xy^2 + 4y^2 - x^3$ as it is harmonic or not. If at all possible, **2+2+2** determine its harmonic conjugate u such that $f(z) = u + iv$ is analytic and hence find the corresponding analytic function $f(z)$ in terms of z.

Q.3 If possible, verify that the function $f(z) = u + iv$, where $f(z) = \begin{cases} \dfrac{x^3 y^4 (x+iy)}{x^6 + y^8}, & z \neq 0 \\ 0, & z = 0 \end{cases}$ is **2+3+2** continuous and that Cauchy-Riemann equations are satisfied at the origin, yet $f'(z)$ does not exist there.

Q.4 If possible, prove that, $u = x^2 - xy^2$ and $v = x^2 y - y^2$ both u and v satisfy Laplace's equation but **2+2+2** $u + iv$ is not analytic function of z.

Class Test-03

Full Marks: 15   **Time: 25 Minutes**

N.B.: Answer **Two** questions including **Q.1** and figures shown in the right margin indicate full marks.

Q.1 What do you mean by Laplace transform for a function $G(t)$. Assess the Laplace transform of   **2+6**

$9t^2 + 19e^{7t} + 7\cos 5t$.

Q.2 If $L\{F(t)\} = f(s)$ and $G(t) = \begin{cases} F(t-b) & \text{when } t > b \\ 0 & \text{when } t < b \end{cases}$, then show that $L\{G(t)\} = e^{-bs} f(s)$.   **7**

Q.3 Applying the Laplace transform, evaluate the Laplace transform of $F(t) = 7e^{5t} \sin^2 2t$.   **7**

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Class Test-04

Full Marks: 15 **Time: 20 Minutes**

N.B.: Figures shown in the right margin indicate full marks.

Q.1 If $L\{F(t)\} = f(s)$ then applying the Laplace transform of second derivative, verify that **7**

$$L\{\sin 3t\} = \frac{3}{s^2 + 9}, \; s > 0.$$

Q.2 Relating the Laplace transform, evaluate (any one) **8**

  i. $L\{t^2 \cos 4t\}$

  ii. $\displaystyle\int_0^\infty t e^{-4t} \cos t \, dt$

  iii. $\displaystyle\int_0^\infty \frac{e^{-2t} - e^{-5t}}{t} \, dt$