GEORGIA INSTITUTE OF TECHNOLOGY
SCHOOL of ELECTRICAL and COMPUTER ENGINEERING

ECE 2026 – Fall 2015   **Quiz 1 (Clicker – 25 Minutes)**   **Version #1**
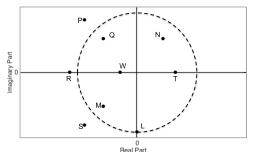
September 11, 2015

Student Name: _____Solutions_____   GT ID #: _____   Clicker ID: _____

Instructions:
1. A calculator and one sheet of paper of letter size with hand-written notes are allowed;
2. Use your clicker to enter your answers and the test version;
3. **Circle your answers on your test** which is to be turned in at the end of test (as a **backup** in case your clicker malfunctions)

Use Clicker to Enter Test Version #:   This is Version #1

PROBLEM 1.1

The complex plane to the left shows 9 locations for a **unique** arrangement of complex numbers that are all based on math operations performed on a **single** complex number $(z = re^{j\theta})$. Shown on the plot are (in no specific order):

$$z; z^*; \frac{1}{z}; \frac{1}{z^*}; z + z^*; z + 1; zz^*; \frac{1}{2}Re\{z\},; \frac{z}{z^*}.$$

Consider all the locations and choose the letter that represents the location for the complex number: z.
(NOTE: There is only ONE possible answer)

(A) L	(B) P	(C) M
(D) Q	(E) R	(F) W
(G) T	(H) S	(I) N

PROBLEM 1.2

Some of the following complex numbers could be solutions to the equation: $z^n + A^{1/2} = 0; A > 0, n > 0$.

$(1) z = A^{\frac{1}{n}}e^{\frac{j\pi}{n}}$	$(2) z = A^{\frac{1}{2n}}e^{\frac{j3\pi}{n}}$	$(3) z = A^{\frac{1}{2n}}e^{\frac{j2\pi}{n}}$	$(4) z = A^{\frac{1}{2n}}e^{\frac{j\pi}{n}}$	$(5) z = A^{\frac{1}{2n}}e^{\frac{j4\pi}{n}}$	$(6) z = A^{\frac{1}{n}}e^{\frac{j3\pi}{n}}$

Which of the following is correct:

(A) (3) and (5) are solutions	(D) (4) and (5) are solutions
(B) (1) and (6) are solutions	(E) (2), (3), (4) and (5) are solutions
(C) (2) and (4) are solutions	(F) (2) and (3) are solutions

PROBLEM 1.3

A sinusoid is generated and plotted by the following MATLAB code:

```
tt = -0.2 : (1/1e3) : 0.8;
xx = -4 + pi*cos(pi*(tt + 0.04)/0.06); plot( xx (100:1000) );
```

How many cycles do you see in the plot? Pick the closest from the table:

(A) 11.25	(C) 12.5	(E) 15	(G) 25
(B) 16.67	(D) 8.33	(F) 7.5	(H) 22.5

PROBLEM 1.4

The answer to this problem is: -27.   However, due to an oversight, that number was not included.   Therefore, ALL answers are accepted.

$$\sum_{k=1}^{25}\left(e^{j\frac{\pi}{25}k} - 1\right) + \sum_{k=25}^{49} e^{j\frac{\pi}{25}k} = ?$$

(A) -24	(C) $e^{j\pi}$	(E) $e^{-j\frac{\pi}{25}} + e^{j\pi}$	(G) 0
(B) 1	(D) -26	(F) -25	(H) $e^{-j\frac{\pi}{25}}$