

GEORGIA INSTITUTE OF TECHNOLOGY
SCHOOL of ELECTRICAL and COMPUTER ENGINEERING

ECE 2026 – Fall 2014

Quiz 1 (Clicker)

September 12, 2014

Student Name: SOLUTION KEY GT ID #: 000 Clicker ID: 000

Instructions:

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| <ol style="list-style-type: none"> 1. A calculator and one sheet of paper of letter size with hand-written notes are allowed; 2. Clear everything other than the single sheet note and a calculator on the desk; 3. Use your clicker to enter your answers; | <ol style="list-style-type: none"> 4. Circle your answers on your test which is to be turned in at the end of test; this is a backup in case your clicker does not function properly; 5. A duration of twenty five minutes has been allocated for this test. |
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Use Clicker to Enter Test Version #: This is Version #1

PROBLEM 1.1

A tonal sound (sinusoid) $x(t) = \sqrt{2} \cos(200\pi t - \frac{\pi}{5})$ is generated at a signal source. It propagates at a speed of 348m/s. You stand at a distance of 58m away from the source. Assume no attenuation occurs during sound propagation. The signal you receive is one of the following; pick your answer.

(A) $x(t) = \sqrt{2} \cos(200\pi t - \frac{\pi}{15})$	(B) $x(t) = \sqrt{2} \cos(200\pi(t - \frac{1}{6}) + \frac{\pi}{5})$	(C) $x(t) = \sqrt{2} \cos(200\pi t - \frac{\pi}{5})$
<input checked="" type="radio"/> (D) $x(t) = \sqrt{2} \cos(200\pi t + \frac{7\pi}{15})$	(E) $x(t) = \sqrt{2} \cos(200\pi(t - \frac{1}{6}) + \frac{\pi}{15})$	(F) $x(t) = \sqrt{2} \cos(200\pi t - \frac{7\pi}{15})$
(G) $x(t) = \sqrt{2} \cos(200\pi t - \frac{4\pi}{5})$	(H) $x(t) = \sqrt{2} \cos(200\pi(t - \frac{1}{6}) - \frac{\pi}{15})$	(I) None of the above

PROBLEM 1.2

Some of the following complex numbers may be solutions to the equation: $(z^2 - 1)^2 = -1$.

(1) $z = e^{-j\pi/4}$	(2) $z = \sqrt[4]{2}e^{-j\pi/8}$	(3) $z = \sqrt[4]{2}e^{-j\pi/4}$	(4) $z = \sqrt[4]{2}e^{-j3\pi/4}$	(5) $z = \sqrt[4]{2}e^{-j7\pi/8}$	(6) $z = e^{j3\pi/4}$
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Which of the following is correct:

(A) (2), (3), and (4) are solutions	<input checked="" type="radio"/> (D) (2) and (5) are solutions
(B) (3) and (4) are solutions	(E) (2) and (4) are solutions
(C) (1) and (6) are solutions	(F) (3) and (5) are solutions

PROBLEM 1.3

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

```
tt = -0.1 : (1/1e4) : 0.6;
xx = 2 + sqrt(3)*cos(pi*(tt + 0.03)/0.03); plot( xx (100:1600) );
```

How many cycles do you see in the plot?

Pick the closest from the table:

(A) 2	(C) 1.5	(E) 3.75	(G) 4.5
(B) 3	(D) 3.33	<input checked="" type="radio"/> (F) 2.5	(H) 5

PROBLEM 1.4

$$\left[\sum_{k=1}^{19} (1 + e^{j\pi k/20}) \right] + \left[\sum_{k=21}^{39} e^{j\pi k/20} \right] = ?$$

(A) 0	<input checked="" type="radio"/> (C) 19	(E) $e^{j38\pi}$	(G) 20π
(B) 20	(D) $e^{j19\pi}$	(F) 38	(H) $e^{j19\pi} + e^{j38\pi}$