

Name _____ CM _____

ECE-300, Quiz #6

1) Assume we are going to synthesize a periodic signal $x(t)$ using $x(t) = \sum c_k e^{jk\omega_0 t}$ where

$c_k = \frac{j}{1+k^2}$. Will $x(t)$ be a real function?

a) Yes b) No

2) Assume we are going to synthesize a periodic signal $x(t)$ using $x(t) = \sum c_k e^{jk\omega_0 t}$

where $c_k = \frac{jk}{1+jk}$. Will $x(t)$ be a real function?

a) Yes b) No

3) Assume $x(t) = 3\cos(2t - 5)$ is the input to a system with transfer function

$$H(\omega) = \begin{cases} 3e^{-j2\omega} & |\omega| < 3 \\ 2 & \text{else} \end{cases}$$

the output $y(t)$ in steady state will be

- a) $y(t) = 6\cos(2t - 5)$ b) $y(t) = 9\cos(2t - 5)$
c) $y(t) = 9\cos(2t - 5)e^{-j4}$ d) $y(t) = 9\cos(2t - 9)$

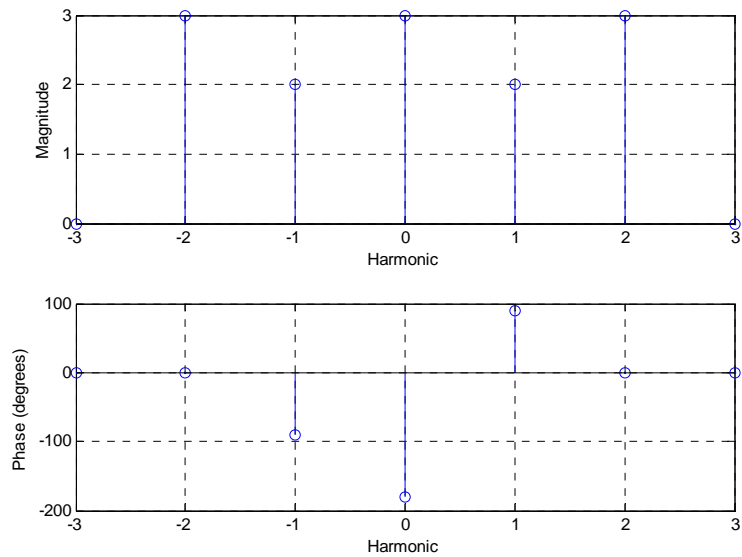
4) Assume $x(t)$ is a periodic function with period $T = 2$ seconds. $x(t)$ is defined over one period as $x(t) = t$, $-1 < t < 1$. The average power in $x(t)$ (the power averaged over one period) is

- a) 0 b) $\frac{1}{2}$ c) $\frac{1}{3}$ d) $\frac{2}{3}$

5) Assume $x(t)$ is a periodic function with Fourier series representation $x(t) = \sum c_k^x e^{jk\omega_0 t}$. $x(t)$ is the input to an LTI system with output $y(t) = 3\dot{x}(t - 2)$. The Fourier series coefficients c_k^y are related to the c_k^x in which of the following ways

- a) $c_k^y = 3jk\omega_0 e^{+jk\omega_0 2} c_k^x$ b) $c_k^y = -3jk\omega_0 e^{-jk\omega_0 2} c_k^x$
c) $c_k^y = 3jk\omega_0 e^{-jk\omega_0 2} c_k^x$ d) $c_k^y = -3jk\omega_0 e^{+jk\omega_0 2} c_k^x$

Problems 6-8 refer to the following spectrum plot for a signal $x(t)$ with fundamental frequency $\omega_0 = 2$. All angles are multiples of 90 degrees.



6) What is the average value of $x(t)$? a) 13 b) $\frac{13}{7}$ c) $\frac{13}{5}$ d) 3 e) -3

7) What is the average power in $x(t)$? a) 13 b) $\frac{13}{7}$ c) 35 d) 3

8) If $x(t)$ is the input to a system with transfer function

$$H(\omega) = \begin{cases} 2 & 1 < |\omega| < 3 \\ 0 & \text{else} \end{cases}$$

the output $y(t)$ in steady state will be

a) $12 \cos(2t)$ b) $4 \cos(2t + 90^\circ)$ c) $8 \cos(t + 90^\circ)$ d) $8 \cos(2t + 90^\circ)$ e) $6 \cos(2t)$