Name_____ CM_____

Quiz 6
(no calculators)

1) Using Euler's identity, we can write $\sin(\omega t)$ as

a) $\frac{e^{j\omega t}-e^{-j\omega t}}{2}$ b) $\frac{e^{j\omega t}+e^{-j\omega t}}{2}$ c) $\frac{e^{j\omega t}+e^{-j\omega t}}{2j}$ d) $\frac{e^{j\omega t}-e^{-j\omega t}}{2j}$

2) Using Euler's identity, we can write $\cos(\omega t)$ as

a) $\frac{e^{j\omega t}+e^{-j\omega t}}{2j}$ b) $\frac{e^{j\omega t}+e^{-j\omega t}}{2}$ c) $\frac{e^{j\omega t}-e^{-j\omega t}}{2}$ d) $\frac{e^{j\omega t}-e^{-j\omega t}}{2j}$

For problems 3 and 4, assume $c_k = e^{-j\pi k} - e^{-j2\pi k}$ and we want to write this as $c_k = e^{j\alpha}\left(e^{j\beta} - e^{-j\beta}\right)$

3) The value of α is

a) $-\frac{k\pi}{2}$ b) $-\frac{3k\pi}{2}$ c) $-\frac{3k\pi}{4}$ d) none of these

4) The value of β is

a) $\frac{k\pi}{4}$ b) $\frac{k\pi}{2}$ c) $\frac{3k\pi}{2}$ d) $\frac{3k\pi}{4}$ e) none of these

5) If $c_k = \frac{\sin(\frac{k\pi}{4})}{\frac{k}{4}}$, then we can write c_k as

a) $c_k = \pi\text{sinc}\left(\frac{k\pi}{4}\right)$ b) $c_k = \text{sinc}\left(\frac{k\pi}{4}\right)$ c) $c_k = \pi\text{sinc}\left(\frac{k}{4}\right)$ d) $c_k = \text{sinc}\left(\frac{k}{4}\right)$

6) If $c_k = \frac{\sin(2k)}{2k}$, then we can write c_k as

a) $c_k = \text{sinc}(\frac{2k}{\pi})$ b) $c_k = \pi\text{sinc}(\frac{2k}{\pi})$ c) $c_k = \text{sinc}(2k)$ d) none of these

7) 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 valued function**?

a) Yes b) No

Problems 8 -10 refer to the following Fourier series representation

$$x(t) = 2 + \sum_{k=-\infty}^{k=\infty} \frac{1}{1+jk} e^{jk\pi t}$$

8) The **average value** of $x(t)$ is a) 0 b) 1 c) 2 d) 3

9) The **fundamental frequency** (in Hz) is a) $\frac{1}{4\pi}$ b) 2 c) $\frac{1}{2\pi}$ d) 0.5

10) The **average power** in the first (fundamental) harmonic is

a) 1 b) 2 c) 0 d) 0.5 e) none of these

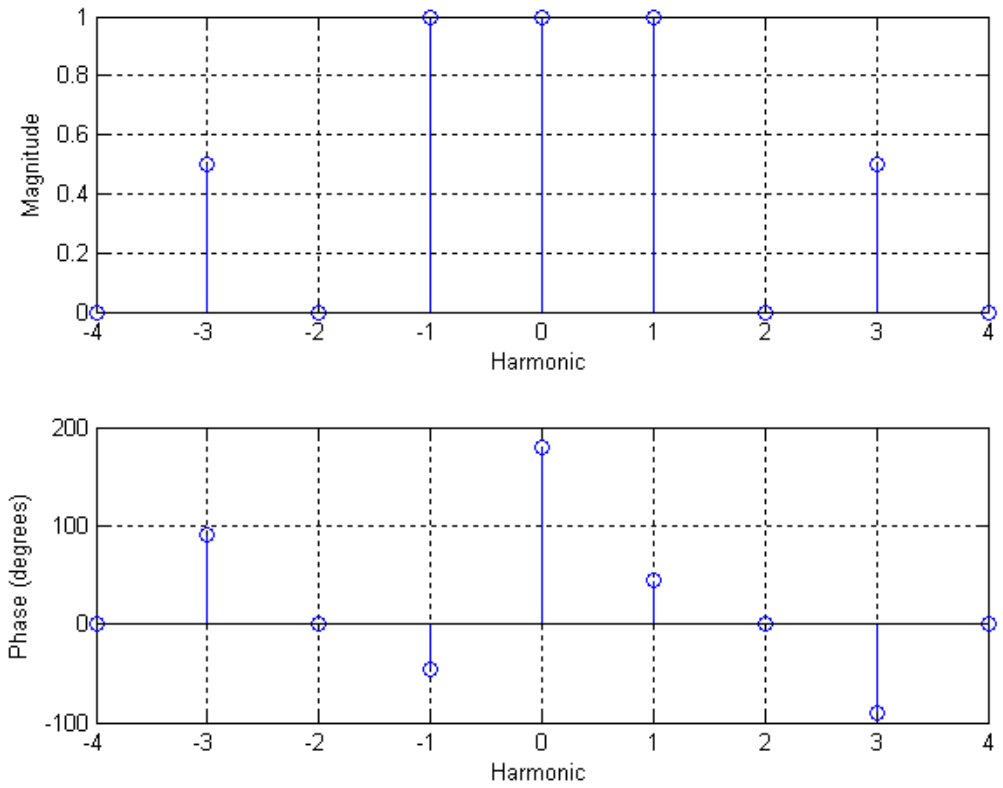
11) Assume $x(t)$ is a periodic function with period seconds $T = 2$. $x(t)$ is defined over one period as

$$x(t) = \begin{cases} -1 & 0 \le t \le 1 \\ 1 & 1 < t < 2 \end{cases}$$

The **average power** in $x(t)$ (the power averaged over one period) is

a) 0 b) 1 c) 2.5 d) 1.5 e) none of these

Problems 12-14 refer to the following spectrum plot for a signal $x(t)$ with fundamental frequency $\omega_o = 2.5$. All angles are multiples of 45 degrees.



12) What is the **average value** of $x(t)$? a) 4 b) 2 c) -1 d) 1

13) What is the **average power** in $x(t)$? a) 4 b) 3.5 c) 2.25 d) 1.5

14) We can write $x(t)$ as

a) $x(t) = 1 + 1\cos(2.5t + 45^o) + 0.5\cos(7.5t - 90^o)$

b) $x(t) = -1 + 1\cos(2.5t + 45^o) + 0.5\cos(7.5t - 90^o)$

c) $x(t) = 1 + 2\cos(2.5t + 45^o) + 1\cos(7.5t - 90^o)$

d) $x(t) = -1 + 2\cos(2.5t + 45^o) + 1\cos(7.5t - 90^o)$

e) none of these