

Name \_\_\_\_\_ CM \_\_\_\_\_

### Quiz 8

(no calculators/tables allowed)

In the following problems you should use the Fourier transform and inverse transform integrals:

$$X(\omega) = \int_{-\infty}^{\infty} x(t)e^{-j\omega t} dt$$
$$x(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} X(\omega)e^{j\omega t} d\omega$$

Don't guess, manipulate the integrals!

1) If  $x(t) \leftrightarrow X(\omega)$ , then  $\alpha x(t + \beta)$  will have Fourier transform

- a)  $\alpha X(\omega)$    b)  $\alpha X(\omega)e^{j\beta\omega}$    c)  $\alpha X(\omega)e^{-j\beta\omega}$    d) none of these

2) If  $x(t) \leftrightarrow X(\omega)$ , then  $\frac{d}{dt}x(t)$  will have Fourier transform

- a)  $\frac{d}{d\omega}X(\omega)$    b)  $-j\omega X(\omega)$    c)  $j\omega X(\omega)$    d) none of these

3) If  $x(t) \leftrightarrow X(\omega)$ , then  $tx(t)$  will have Fourier transform

- a)  $j\frac{d}{d\omega}X(\omega)$    b)  $-j\frac{d}{d\omega}X(\omega)$    c)  $\frac{d}{d\omega}X(\omega)$    d) none of these

4) If  $x(t) \leftrightarrow X(\omega)$ , then  $x\left(\frac{t}{\alpha}\right)$  for  $\alpha > 0$  will have Fourier transform

- a)  $X\left(\frac{\omega}{\alpha}\right)$    b)  $X(\alpha\omega)$    c)  $\frac{1}{\alpha}X\left(\frac{\omega}{\alpha}\right)$    d)  $\alpha X(\alpha\omega)$    e) none of these

5) If  $x(t) \leftrightarrow X(\omega)$ , then  $x(t)e^{j\beta t}$  will have Fourier transform

- a)  $X(\omega)e^{-j\beta t}$    b)  $X(\omega + \beta)$    c)  $X(\omega - \beta)$    d) none of these

6) If  $x(t) = 2\delta(t-3)$ , then  $X(\omega)$  is

- a)  $2e^{j3\omega}$  b)  $2e^{j3\omega}u(t)$  c)  $2e^{j3\omega}u(\omega)$  d)  $2e^{-j3\omega}$  e) none of these

7) If  $X(\omega) = 3\delta(\omega-2)$ , then  $x(t)$  is

- a)  $3e^{j2t}$  b)  $\frac{3}{2\pi}e^{j2t}$  c)  $\frac{3}{2\pi}e^{j2t}u(t)$  d)  $\frac{3}{2\pi}e^{-j2t}$  e) none of these

8) If  $X(\omega) = \text{sinc}\left(\frac{\omega T}{2\pi}\right)$ , the first nulls (zero points) are at

- a)  $\omega = \pm 1$  b)  $\omega = \pm \frac{\pi}{T}$  c)  $\omega = 0$  d)  $\omega = \pm \frac{T}{\pi}$  e) none of these

9) If  $x(t) = A\sin(2t)$ ,  $X(\omega)$  will be nonzero

- a) for all  $\omega$  b) for all  $\omega = 2k$ ,  $k$  an integer c) for  $\omega = 2$  only d) for  $\omega = \pm 2$

10) If we have the transfer function

$$H(s) = \frac{1}{(s+2)(s+20)}$$

the bandwidth of the system is

- a) 2 rad/sec b) 2 Hz c) 20 rad/sec d) 20 Hz e) none of these