

GEORGIA INSTITUTE OF TECHNOLOGY

SCHOOL OF ECE

EE 3230

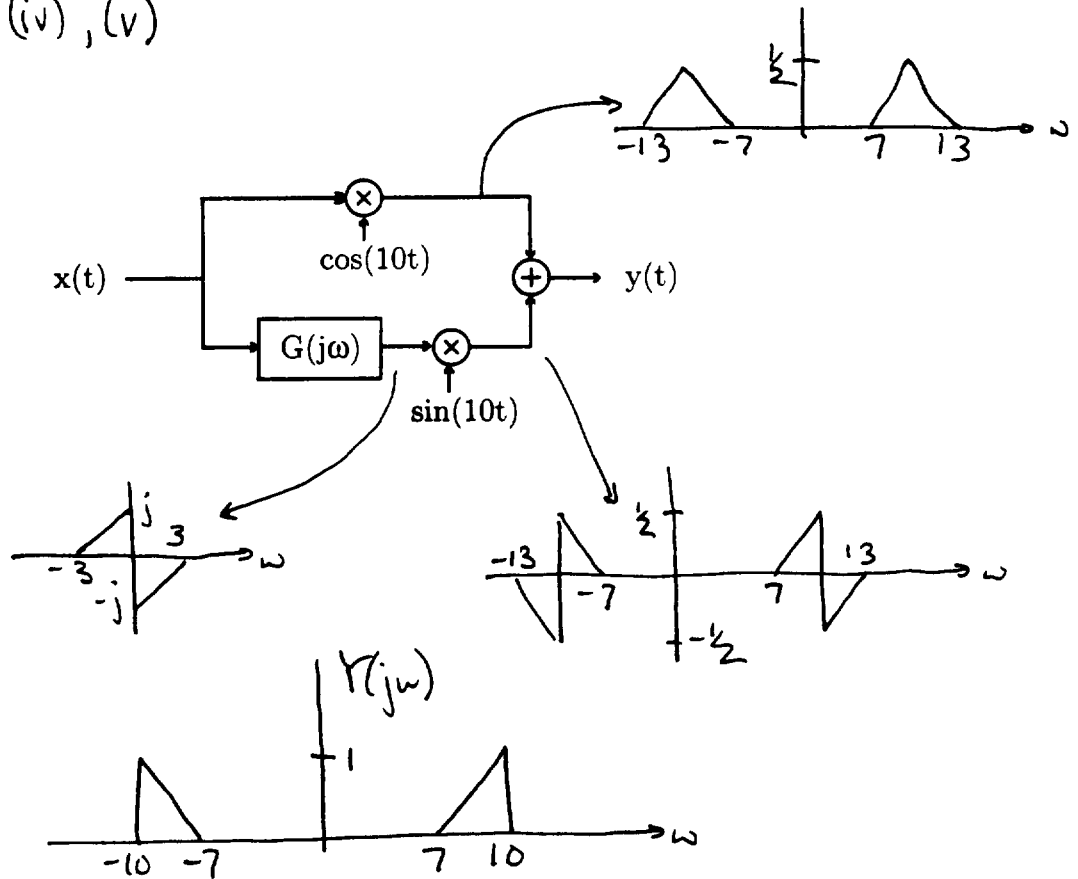
SOLUTIONS TO QUIZ # 2

- ① (i) $x(0) = 0 \Rightarrow \int_{-\infty}^{\infty} X(j\omega) d\omega = 0$ (ii) $E\{x(t)\} = 0 \Rightarrow X(j\omega)$ is odd
 (iii) $x(t)$ is real $\Rightarrow \text{Re}\{X(j\omega)\}$ is even and $\text{Im}\{X(j\omega)\}$ is odd (iv) $x(t)$ is periodic $\Rightarrow X(j\omega)$ composed of equally spaced impulses
 (v) $\int_{-\infty}^{\infty} t x(t) dt = 0 \Rightarrow \left. \frac{d}{d\omega} X(j\omega) \right|_{\omega=0} = 0$

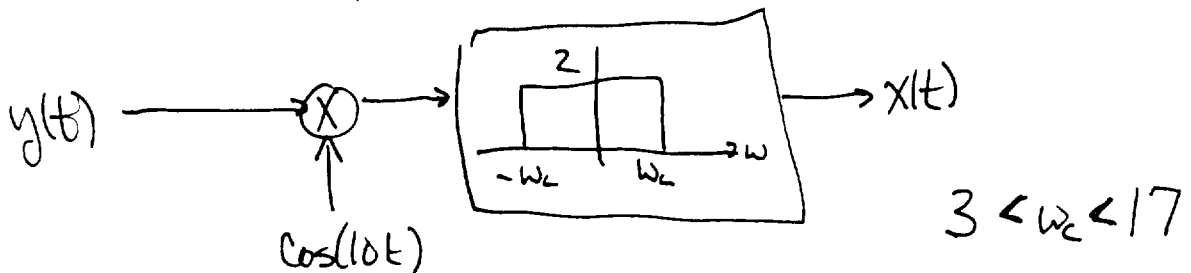
(a) (iii), (v)

(b) (i), (ii), (iv), (v)

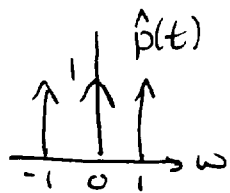
② (a)



(b)

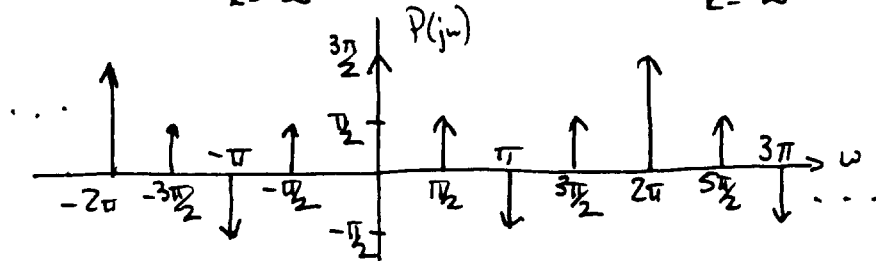


(3) (a)

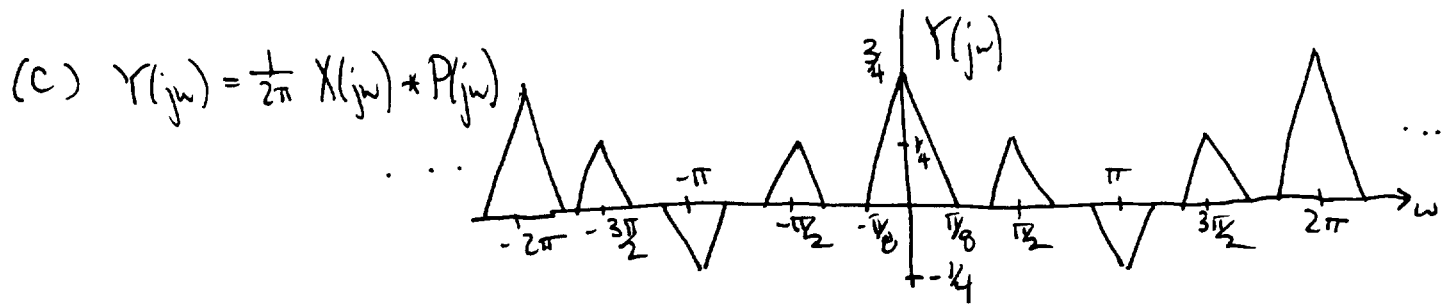


$$\hat{P}(j\omega) = 1 + 2\cos(\omega) \Rightarrow a_k = \frac{1}{4} \left[1 + 2\cos\left(\frac{\pi k}{2}\right) \right]$$

$$P(j\omega) = 2\pi \sum_{k=-\infty}^{\infty} a_k \delta\left(\omega - \frac{2\pi k}{4}\right) = \frac{\pi}{2} \sum_{k=-\infty}^{\infty} \left[1 + 2\cos\left(\frac{\pi k}{2}\right) \right] \delta\left(\omega - \frac{\pi k}{2}\right)$$



$$(b) p(t) = \sum_{k=-\infty}^{\infty} \frac{1}{4} \left[1 + 2\cos\left(\frac{\pi k}{2}\right) \right] e^{j k \frac{\pi t}{2}}$$



$$(4) (a) Y(s) = \frac{s}{s-3} X(s) \Rightarrow H(s) = \frac{s}{s-3+k} = 1 + \frac{3-k}{s-3+k}$$

$$\Rightarrow h(t) = \delta(t) + (3-k) e^{(3-k)t} u(t)$$

(b) Pole at $s=3-k$ needs to be in LHP $\Rightarrow \underline{k > 3}$

$$(c) H_I(s) = \frac{s-3+k}{s} = 1 + \frac{k-3}{s} \text{ for either } \operatorname{Re}\{s\} > 0 \text{ or } \operatorname{Re}\{s\} < 0$$

\Rightarrow 2 possible inverse systems.