ECE 310 Online
Summer 2019

HW10

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(1). $\Omega_c = \frac{2}{T}\tan(\frac{\omega_c T}{2}) = 2\tan(\frac{\pi}{6})$

(2) $H(z) = H(s)\Big|_{s=\frac{2}{T}(\frac{z-1}{z+1})}$

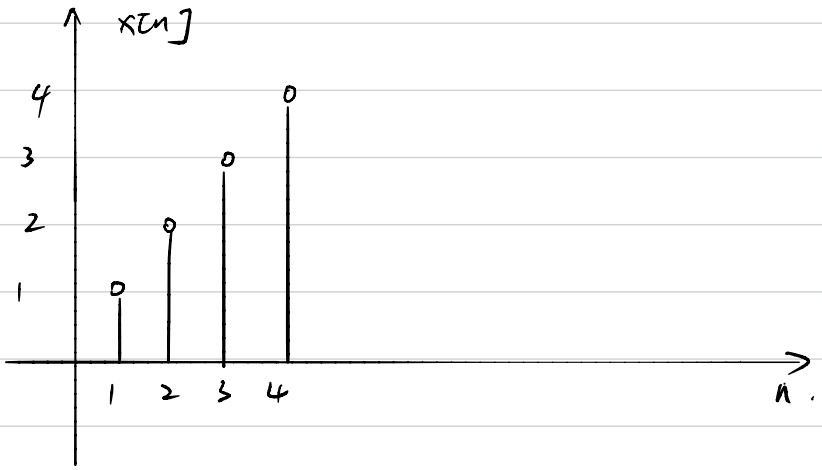
$$H(z) = \frac{2\cdot(\frac{z-1}{z+1})}{2(\frac{z-1}{z+1})+2} = \frac{z-1}{2z}$$

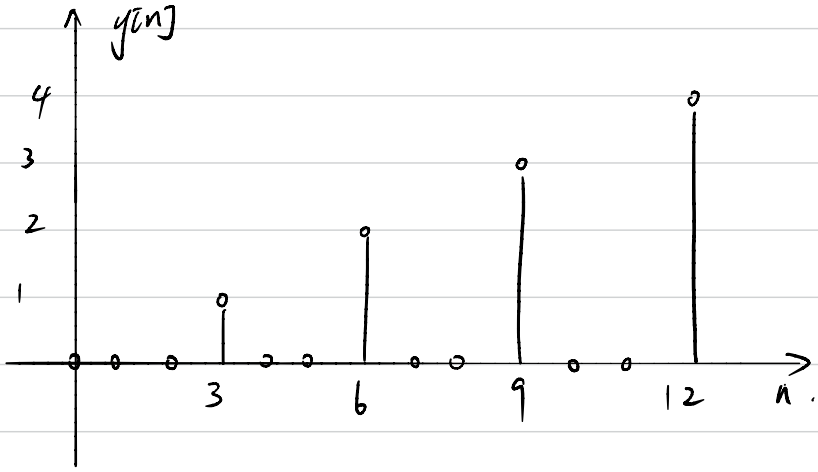
(3) $\omega_c - \omega_s = \frac{\pi}{10}$

$$\omega_c = \frac{3}{5}\pi - \frac{1}{10}\pi = \frac{5}{10}\pi = \frac{1}{2}\pi.$$

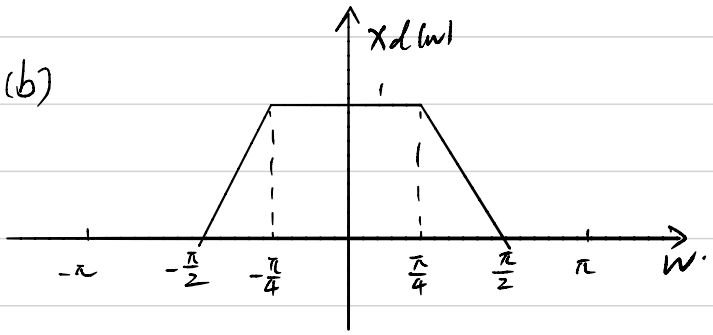
$$\Omega = \frac{2}{T}\tan\frac{\omega}{2} = 2\tan\frac{\pi}{2\times 10} = 0.3167\,Hz$$

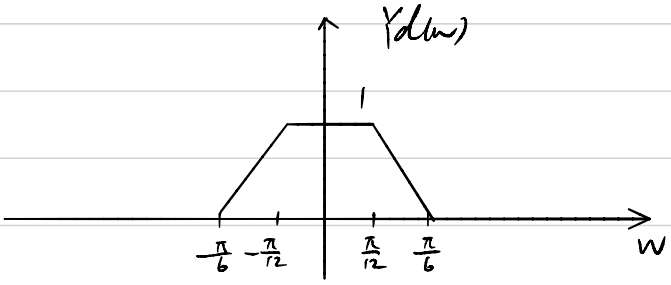
(4) (a) $y[n] = \begin{cases} x[n/3] & n \text{ is multiple of } 3 \\ 0 & \text{else} \end{cases}$





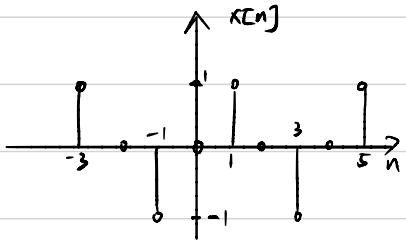
(b)

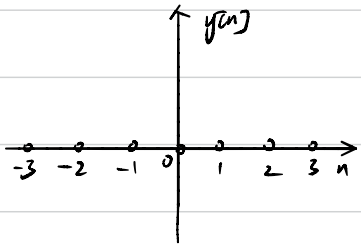




(5). (a) $x[n]=\sin(n\frac{\pi}{2})$

$y[n]=\begin{cases}\sin(n\pi)\\0\end{cases}$

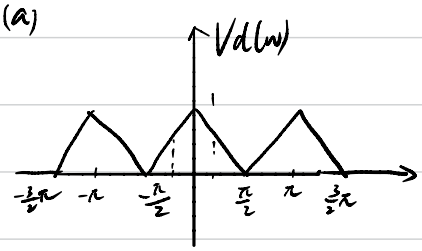




(b) $X_d(w)=\frac{1}{1-\frac{1}{2}e^{-jw}}=\frac{1}{1-\frac{1}{2}z^{-1}}=\frac{z}{z-\frac{1}{2}}\Rightarrow(\frac{1}{2})^n\cdot u[n]$

$y[n]=x[2n]=(\frac{1}{2})^{2n}\cdot u[2n]=(\frac{1}{4})^n\cdot u[2n]=(\frac{1}{4})^n\cdot u[n]\Rightarrow\frac{z}{z-\frac{1}{4}}=\frac{1}{1-\frac{1}{4}z^{-1}}=\frac{1}{1-\frac{1}{4}e^{-jw}}$

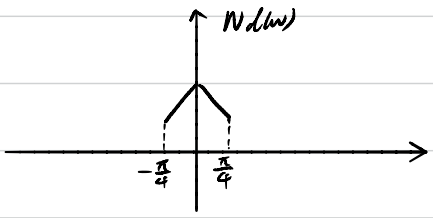
6. (a)

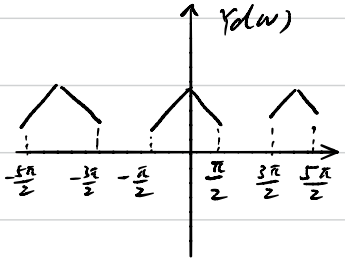


$\frac{4}{\pi}$

(b) $rect(\frac{2w}{\pi})=H(w)$.

(c) It's LSI.





(c)