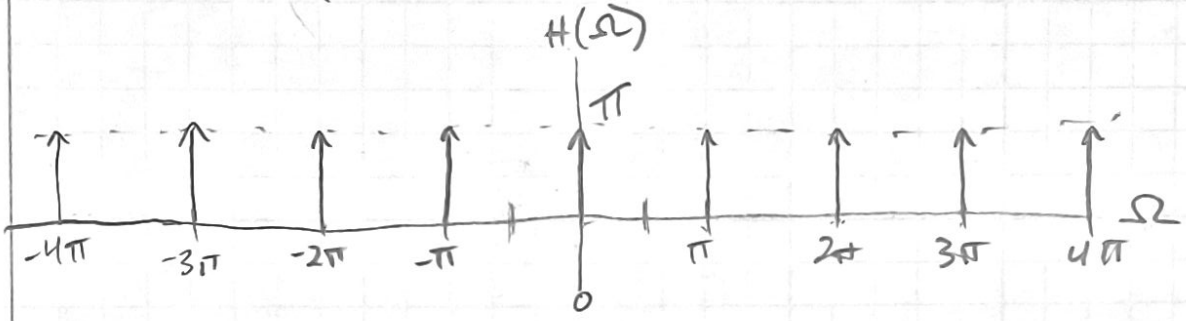
$$y[n] = x[n] \cdot h[n]$$

where $h[n] = \frac{1}{2}\left(e^{j\pi n} + 1\right)$

using Transform pair: $e^{j\Omega_0 n} \iff 2\pi \sum_{k=-\infty}^{\infty} \delta(\Omega - \Omega_0 - 2\pi k)$

$$H(\Omega) = \pi\left(\ldots + \delta(\Omega - \pi - 0) + \delta(\Omega) + \delta(\Omega - \pi + 2\pi) + \ldots\right)$$



$$x[n] \cdot h[n] \iff \frac{1}{2\pi} X(\Omega) * H(\Omega)$$

Convoluting with delta leads to replication. So, $Y(\Omega)$ will be periodic replications of $X(\Omega)$ centered every πK for $K = -\infty : \infty$ and scaled by $\frac{1}{2\pi}$. The maximum bandwidth $X(\Omega)$ can be is π