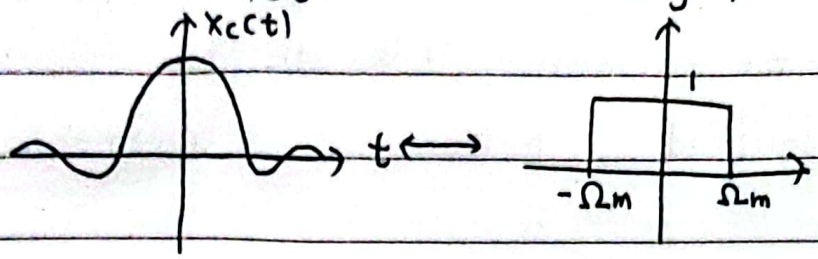
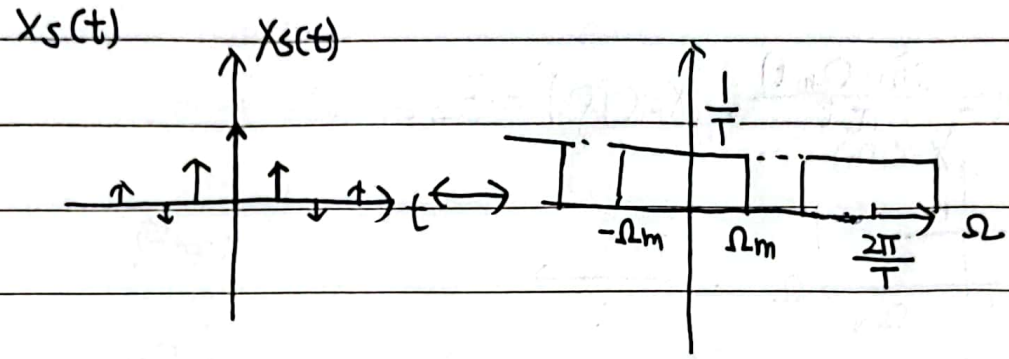
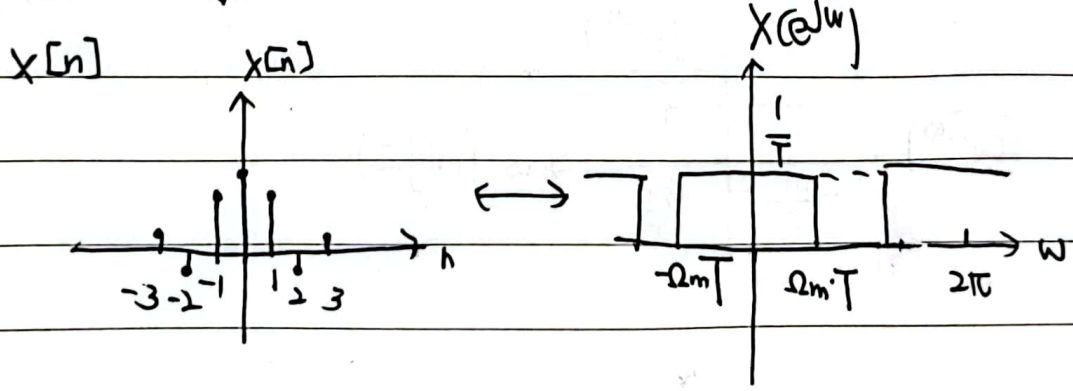
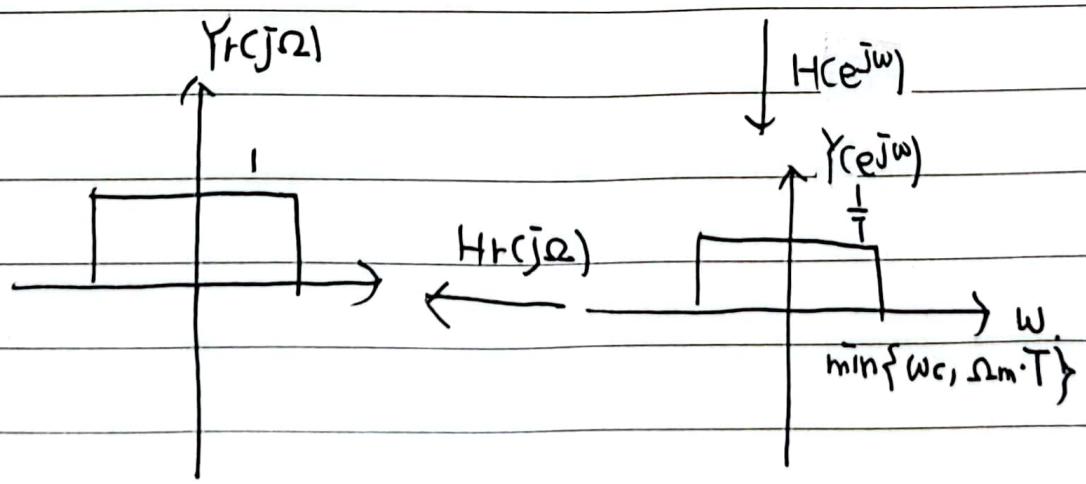
(1) $x_c(t) = \frac{\sin(\Omega_m t)}{\pi t}$

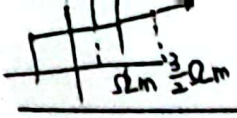


Sampling





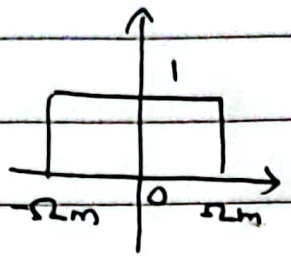




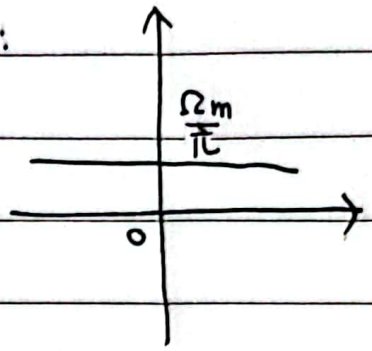
$\frac{1}{2}\Omega_m \cdot T$ $\frac{3}{2}\Omega_m T$

(i) $T = \frac{\pi}{\Omega_m}$:

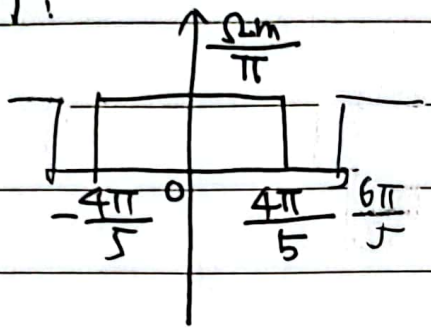
$X_c(j\Omega)$:



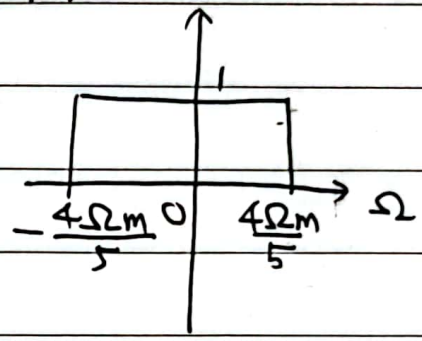
$X(e^{jw})$:



$X(e^{jw})$:

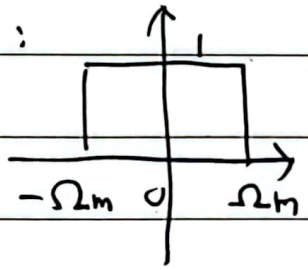


$Y_r(j\Omega)$:

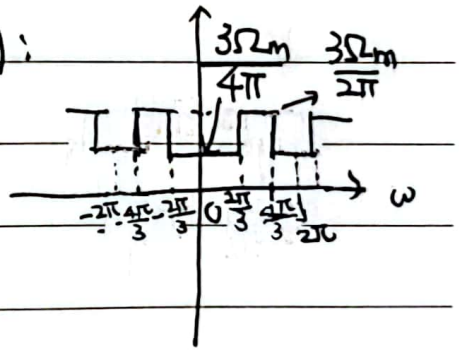


(ii) $T = \frac{4\pi}{3\Omega_m}$

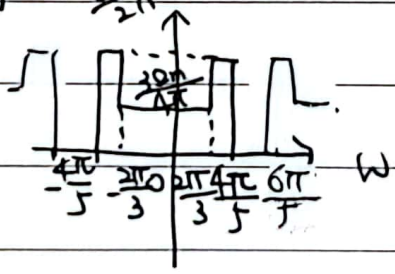
$X_c(j\Omega)$:



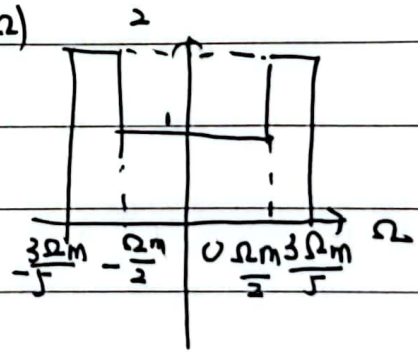
$X(e^{jw})$:



$Y(e^{jw})$: $\frac{3\Omega_m}{2\pi}$

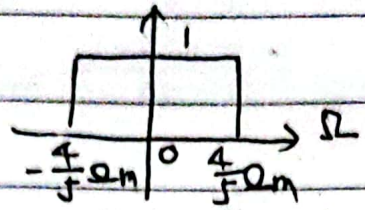


$Y_r(j\Omega)$

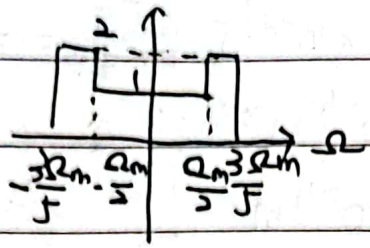


(2) for(i): $X_c(j\Omega) \xrightarrow{H_{eff}(j\Omega)} Y_r(j\Omega)$

$H_{eff}(j\Omega)$:



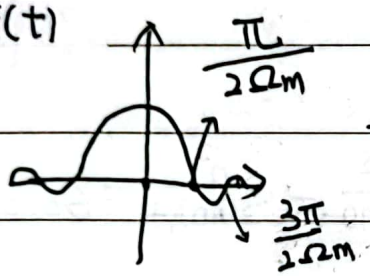
for(ii): $X_c(j\Omega) \xrightarrow{H_{eff}(j\Omega)} Y_r(j\Omega)$



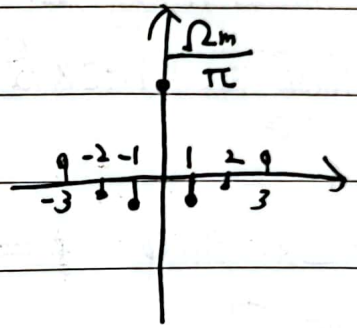
not always hold

(3) $T=\frac{2\pi}{3\Omega_m}$, $\omega_c=\pi$

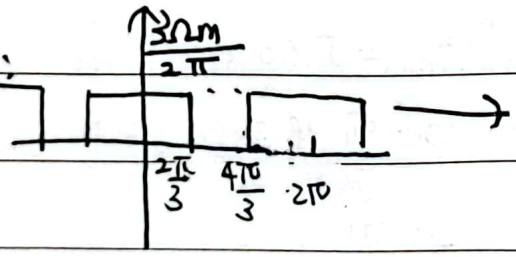
$x_c(t)$



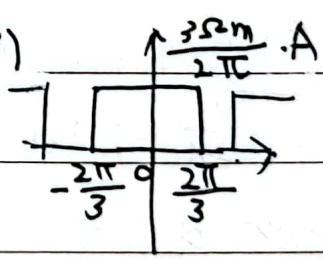
$x[n]$



$X(e^{j\omega})$:



$Y(e^{j\omega})$



对 $Y(e^{j\omega})$ 采样 ⟷ 对 $y[n]$ 进行周期延拓

由于 $y[n]$ 不带限，故必有混叠，无法实现

(4). Yes. there $\omega_c = \pi$, we can choose $A = 1$ so that $y[n] = x[n]$.

Let $N \geq L$, ⇒ 对 0 ~ L-1 时段进行以 $N \geq L$ 为周期的时移这样就不会产生混叠。