$x_r(t) = x_s(t) * h(t) \qquad h(t) = \frac{T\sin(\omega_c t)}{\pi t}$ ⓐ ①

$$x_r(t) = \left[\sum_{n=-\infty}^{+\infty} x(nT)\,\delta(t-nT)\right] * h(t)$$

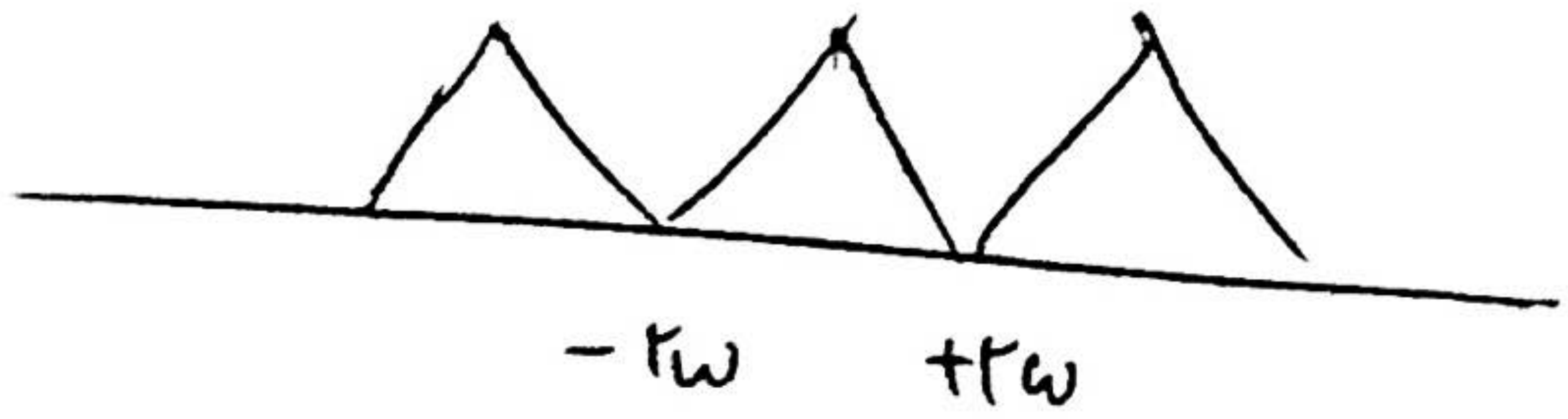
$$= \sum_{n=-\infty}^{+\infty} x(nT)\,h(t-nt) = \sum_{n=-\infty}^{+\infty} x(nT)\,\frac{T\sin(\omega_c(t-nT))}{(\pi)(t-nT)}$$

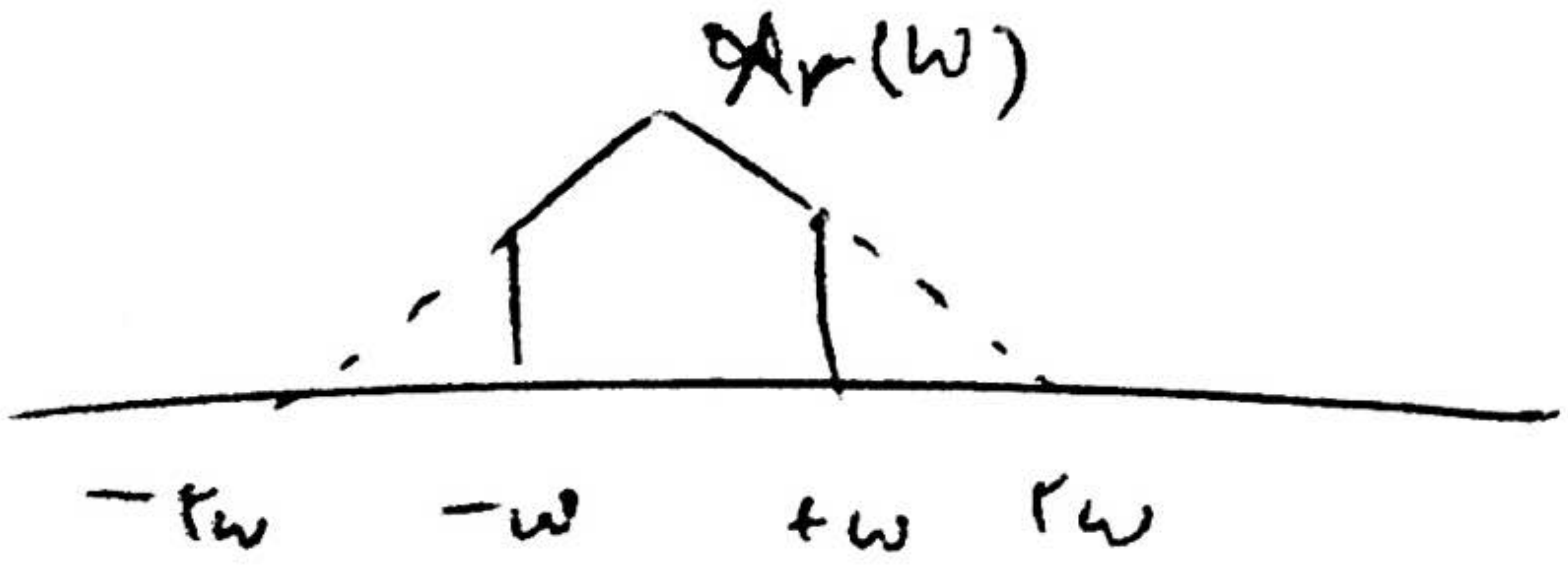
$$\boxed{= T\sum_{n=-\infty}^{+\infty} x(nT)\,\frac{\sin(\omega_c(t-nT))}{\pi(t-nT)}}$$

$$x(t) = \cos(۲\pi f_0 t+\theta) = \cos(1500\pi t + \pi/_4)$$

$$= \frac{1}{1000}\sum_{n=-\infty}^{+\infty} \cos(۲\pi/_{۲}\, n\pi t + \pi/_4) \times \sin\frac{(1000\pi t - 1000\pi n)}{\pi(t-\frac{n}{1000})}$$

$\omega_M = ۲\omega = \pi/_T \qquad \omega_s = \frac{۲\pi}{T} \longrightarrow \boxed{\omega_s = ۲\omega_M}$ (i ⓑ



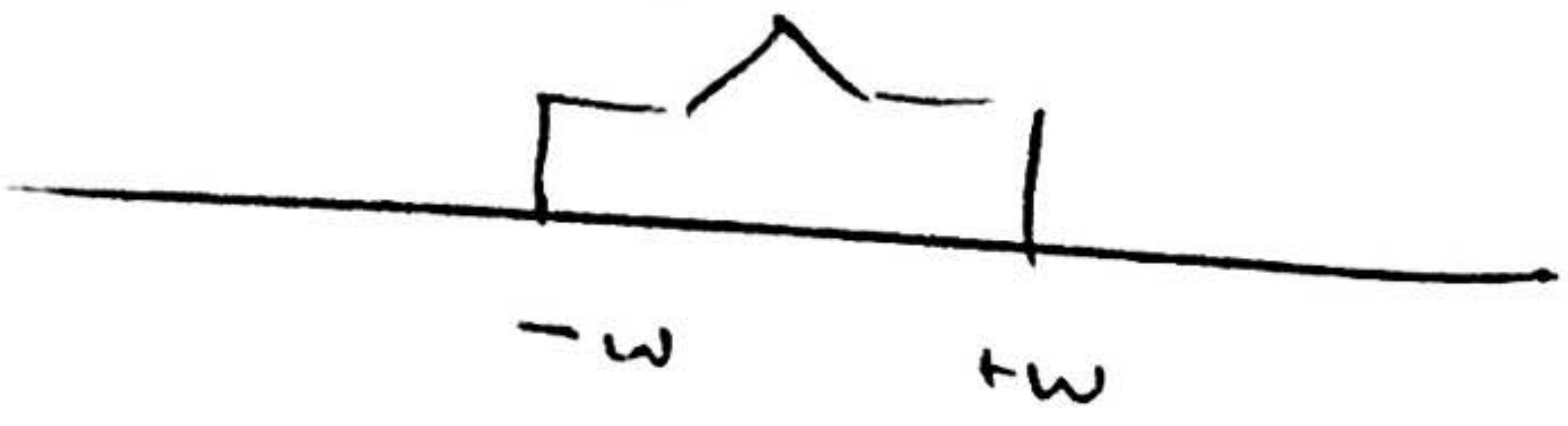


$1 \quad X.(W \quad \omega_m = ۱۰W \Rightarrow$

① (b) (ii

$\omega_M = \frac{\pi}{۲T} \qquad \omega_s = \frac{۲\pi}{T} \to \boxed{\omega_s = 4\omega_m}$

$X_p(\omega)$



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② (a)

$\cos(\omega_0 nT) = (-1)^n \to \cos(1000\,\omega_0 n)$

$1000\,\omega_0 = \pi k \to \omega_0 = \frac{k\pi}{1000} \to \pi, ۳\pi$

(b) هر دو می‌تواند باشد . (i) ← LPF بوده

(ii) ← سیستم فشرده ساز

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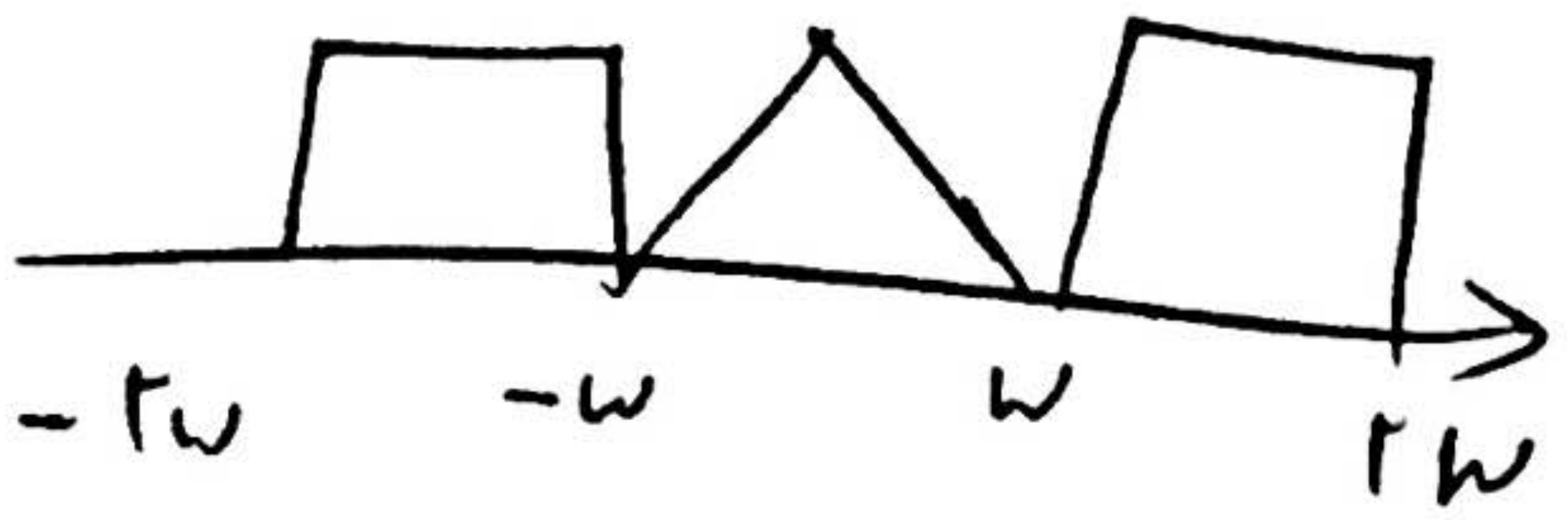
③

$I(\omega) = X(\omega) + N(\omega)$



$I_s(\omega) = \frac{1}{T} \sum I(j(\omega - \omega_k)) \to A = T$

$\boxed{\omega_s - ۲\omega > \omega \to \omega_s > ۳\omega} \to \boxed{T < \frac{۲\pi}{۳\omega}}$

(a ج

$\omega_m = \omega \rightarrow \omega_s > ۲\omega_m \Rightarrow \frac{۲\pi}{T} > ۲\omega \rightarrow \boxed{T < \frac{\pi}{\omega}}$

$\omega_s < \omega_s - \omega_m \Rightarrow \boxed{\omega_c < \frac{۲\pi}{T} - \omega}$

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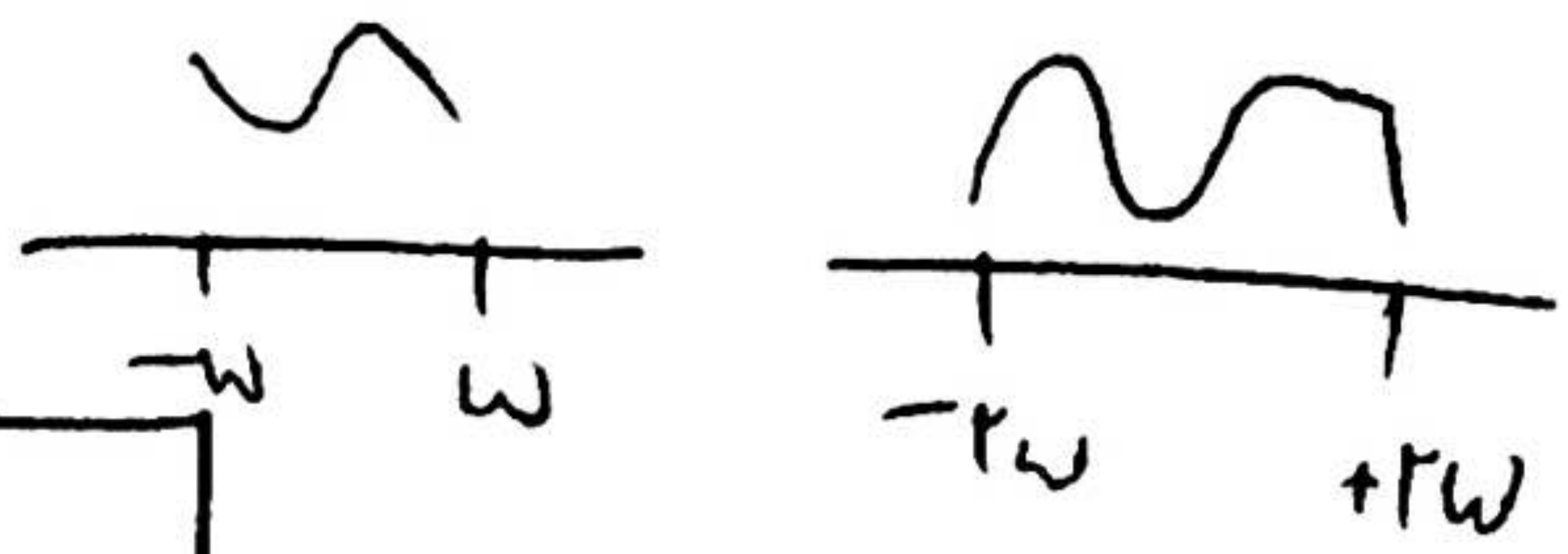
b



i) $X(j\omega) = X_1 \times X_2 \Rightarrow \boxed{\omega_m = \omega}$

ii) $X(j\omega) = X_1 + X_2 \Rightarrow \omega_m = ۲\omega \Rightarrow \frac{۲\pi}{T} > ۴\omega \rightarrow \boxed{T < \frac{\pi}{۲\omega}}$

$\omega_c < \omega_s - \omega_m \Rightarrow \boxed{\omega_c < \frac{۲\pi}{T} - ۲\omega}$

iii) $X(j\omega) = X_1 * X_2 \rightarrow \boxed{\omega_m = ۳\omega}$

iv) $X(j\omega) = \frac{1}{۱۰} X_1\left(\frac{\omega}{۱۰}\right) \Rightarrow \omega_m = ۱۰\omega \Rightarrow T < \frac{\cancel{\pi}}{۵\omega}, \omega_c < \frac{\pi \times ۲}{\cancel{\pi}} - ۱۰\omega$