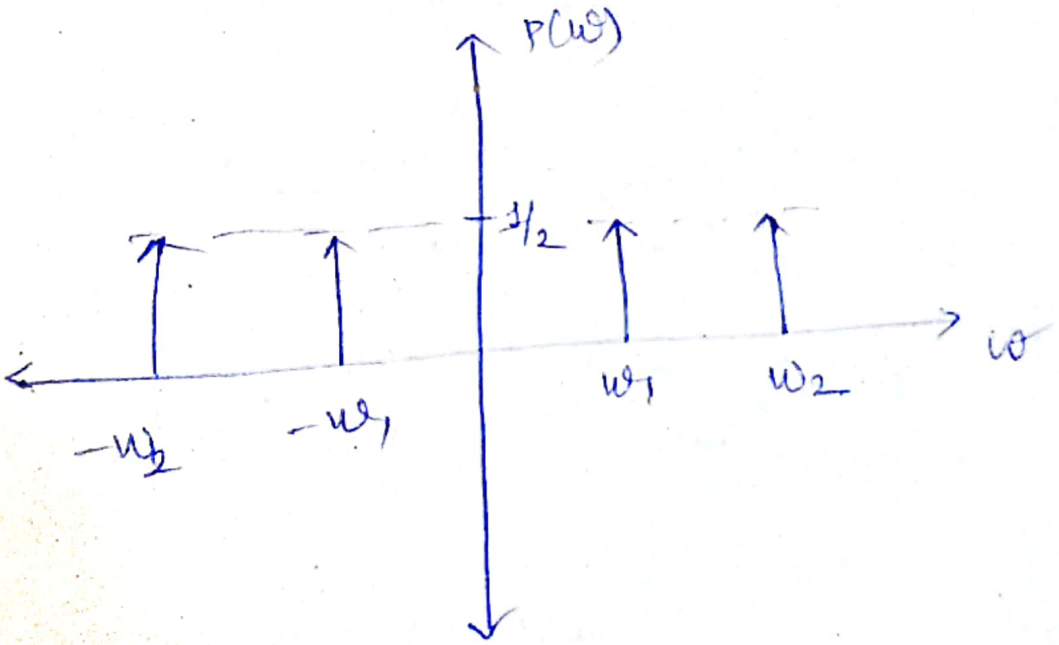
8.1

a) $p(t) = \cos(\omega_1 t) + \cos(\omega_2 t)$, $\omega_1 < \omega_2$

$$FT(\cos \omega_0 t) = \frac{\delta(\omega - \omega_0) + \delta(\omega + \omega_0)}{2}$$

$$P(\omega) = \frac{\delta(\omega - \omega_1) + \delta(\omega + \omega_1)}{2} + \frac{\delta(\omega - \omega_2) + \delta(\omega + \omega_2)}{2}$$

$$P(\omega) = \frac{\delta(\omega - \omega_1) + \delta(\omega - \omega_2) + \delta(\omega + \omega_1) + \delta(\omega + \omega_2)}{2}$$

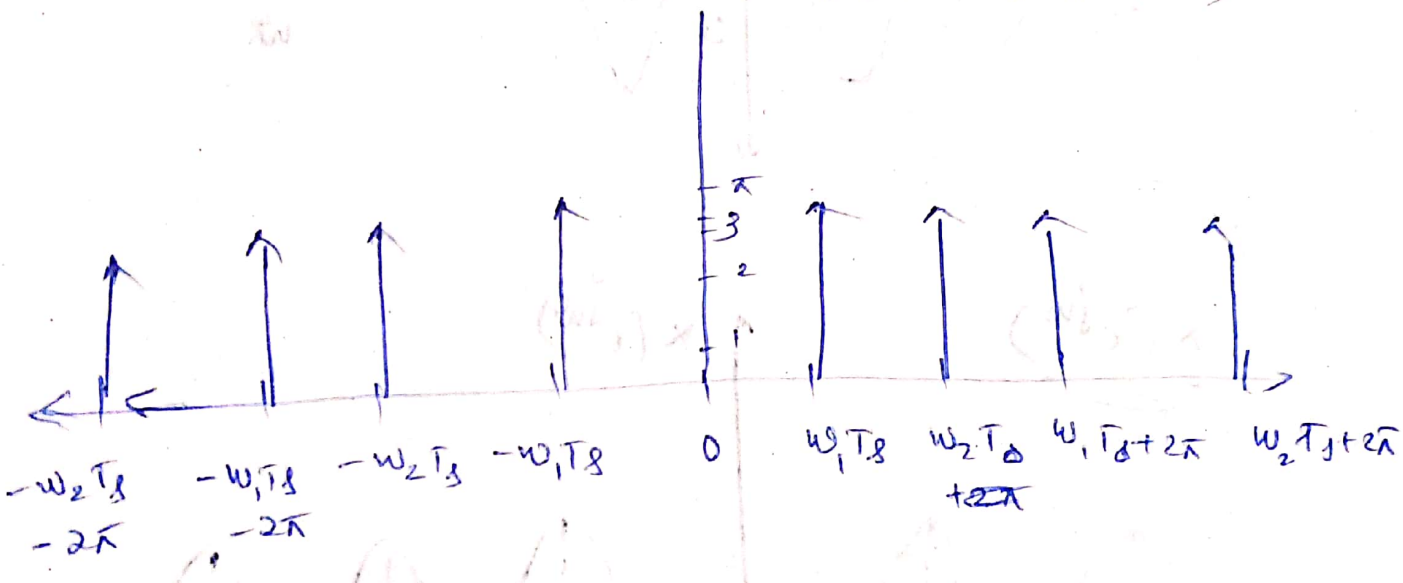


b) $p[n] = \cos(\omega_1 n T_s) + \cos(\omega_2 n T_s)$

$$P(e^{j\omega}) = \sum_{n=-\infty}^{\infty} p[n] e^{-j\omega n}$$

$$= \pi \left(\sum_{l=-\infty}^{\infty} \left(\delta(\omega - \omega_1 T_s - 2\pi l) + \delta(\omega + \omega_1 T_s - 2\pi l) \right) \right.$$

$$\left. + \sum_{l=-\infty}^{\infty} \delta(\omega - \omega_2 T_s - 2\pi l) + \delta(\omega + \omega_2 T_s - 2\pi l) \right)$$



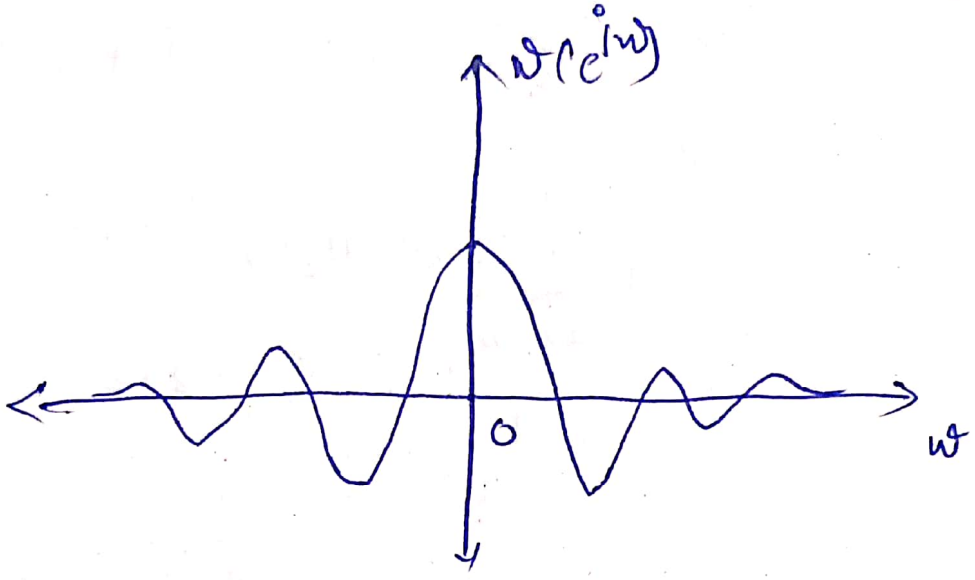
c) $x[n] = p[n]\, w[n]$

$$X(e^{j\omega}) = P(e^{j\omega}) * W(e^{j\omega})$$

$$W(e^{j\omega}) = \frac{\sin\left(\omega\left(\frac{L-1}{2} + \frac{1}{2}\right)\right)}{\sin(\omega/2)} e^{-j\omega\frac{(L-1)}{2}}$$

$$= \frac{\sin\left(w\left(\frac{L}{2}\right)\right)}{\sin\left(\frac{w}{2}\right)} \; e^{-jw\left(\frac{L-1}{2}\right)}$$

(sinc func.)



$x(e^{jw})$