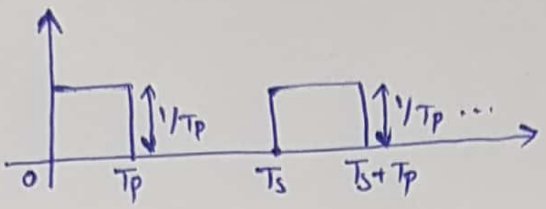
Tutorial 1 Question 2

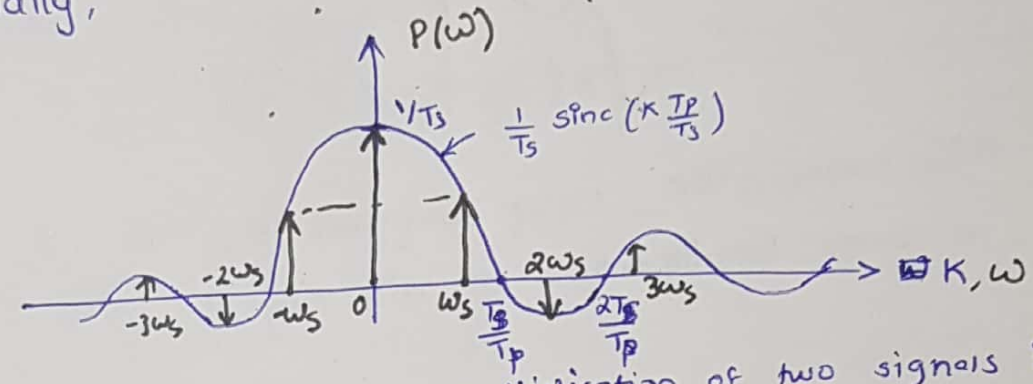
P(t)



from Question no. 1 we already know that

$$P(\omega) = \sum_{K=-\infty}^{\infty} \frac{1}{T_s} \exp\left(-j\pi K \frac{T_p}{T_s}\right) \operatorname{sinc}\left(K\frac{T_p}{T_s}\right) \delta\left(\omega - \frac{2\pi}{T_s} K\right)$$

pictorially,



The Fourier transform of a multiplication of two signals is the convolution of their individual Fourier Transforms.

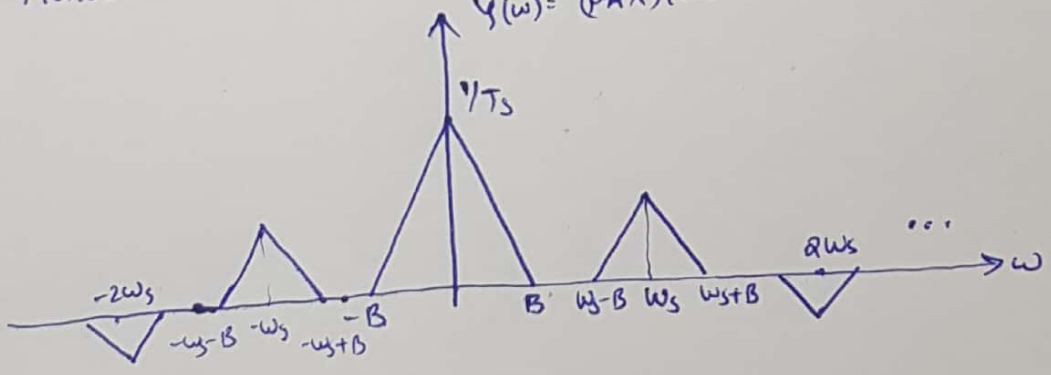
Hence, p(t) acts as the sampling signal that is used for sampling x(t). where $\frac{2\pi}{T_s} = \omega_s$ = sampling frequency

& B = Bandwidth of x(t)

(i) $\omega_s > 2B$: Nyquist criteria is satisfied

Hence the resultant spectrum is given by:

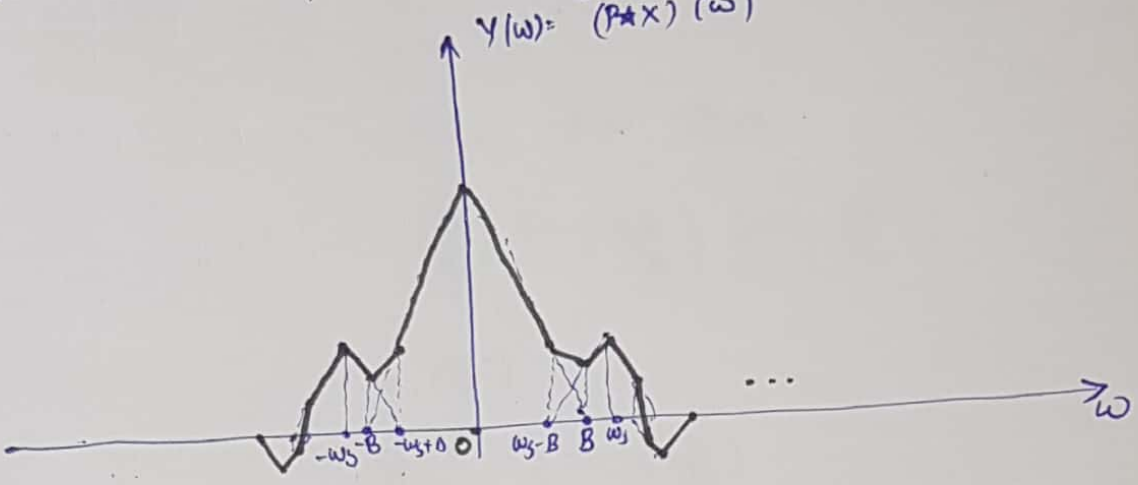
$Y(\omega) = (P \star X)(\omega)$



(b) $B < \omega_s < 2B$: Nyquist criteria is not satisfied

Hence ALIASING takes place :

The resultant spectrum is given by



The two different triangular pulses add/subtract with each other to give rise to a complicated spectrum which is not periodic