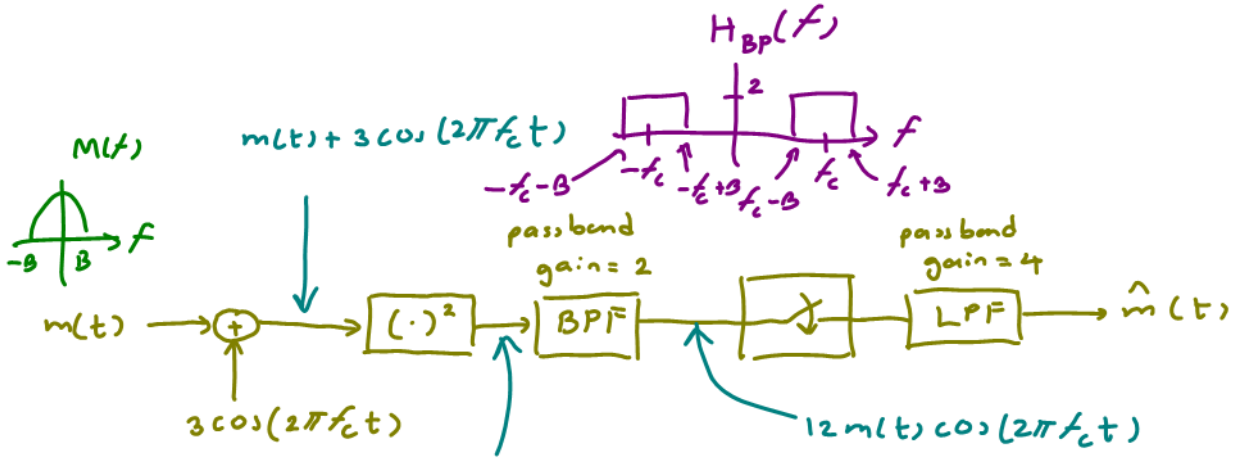
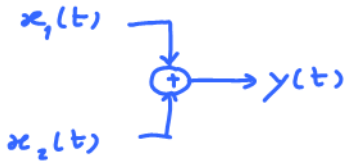
$$\left(3 \times \sqrt{\frac{(2+3)^2 - 5}{5}} \right) + 8$$



$$\left(m(t) + 3\cos(2\pi f_c t)\right)^2$$

$$= m^2(t) + 9\cos^2(2\pi f_c t) + 6\, m(t)\cos(2\pi f_c t)$$

① 

$y(t) = x_1(t) + x_2(t)$

$Y(f) = X_1(f) + X_2(f)$

(2.32) Linearity of FT (superposition)

② Exercise ※5

$x(t) \rightarrow \boxed{(\cdot)^2} \rightarrow y(t)$

$y(t) = x^2(t)$

$Y(f) = X(f) * X(f)$

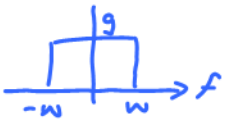
③ $x(t) \rightarrow \boxed{H(f)} \rightarrow y(t)$

$y(t) = h(t) * x(t)$

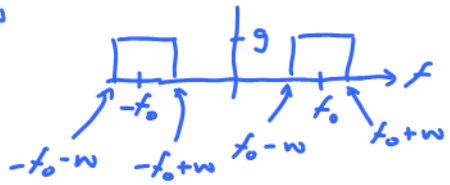
$Y(f) = H(f)X(f)$

} (2.40) convolution theorem

LPF : $H(f) = \begin{cases} g, & |f| < W, \\ 0, & \text{otherwise.} \end{cases}$



BPF : $H(f) = \begin{cases} g, & |f \mp f_0| < W \\ 0, & \text{otherwise.} \end{cases}$



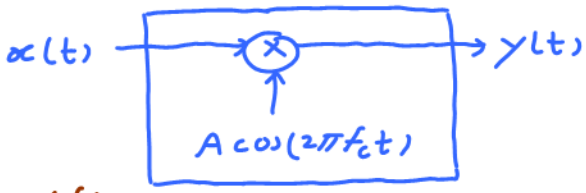
④ multipath channel

[3.23]

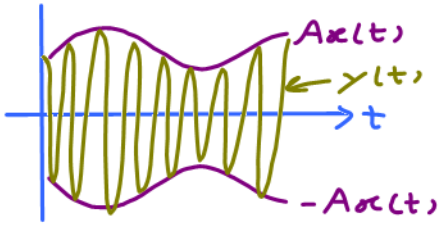
$h(t) = \sum_{k=1}^{N} \alpha_k \delta(t - \tau_k) \xrightarrow{\mathcal{F}} H(f) = \sum_{k=1}^{N} \alpha_k e^{-j2\pi\tau_k f}$

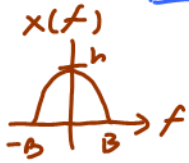
$y(t) = \sum_{k=1}^{N} \alpha_k x(t - \tau_k) \xrightarrow{\mathcal{F}} Y(f) = (\quad)X(f)$

⑤ Exercise ※4

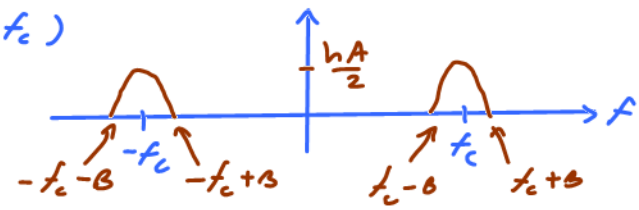


$y(t) = x(t) A\cos(2\pi f_c t)$



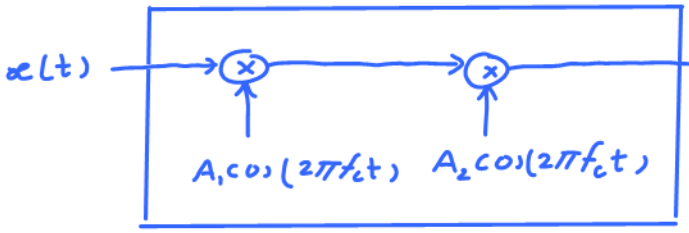


$Y(f) = \frac{A}{2} X(f - f_c) + \frac{A}{2} X(f + f_c)$



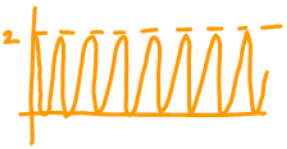
(6)

$\cos^2\alpha = \frac{1+\cos(2\alpha)}{2}$

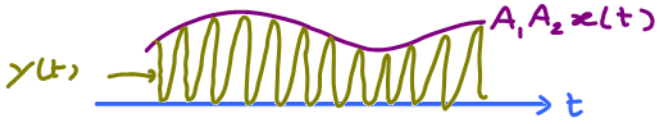


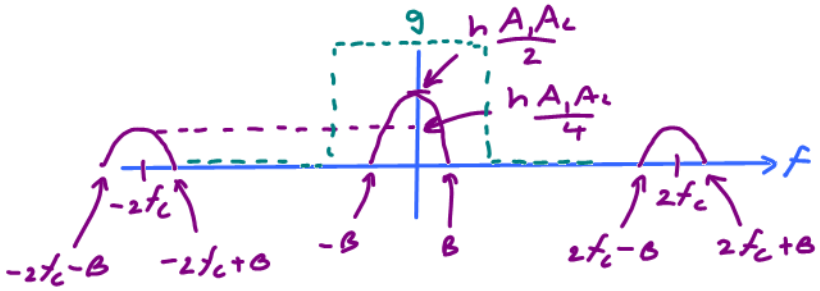
$y(t) = A_1A_2\cos^2(2\pi f_c t)\,x(t)$

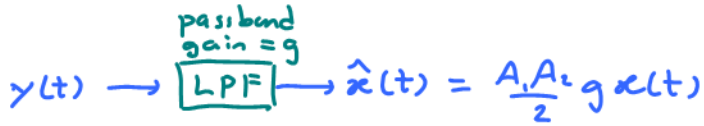
$= \frac{A_1A_2}{2}\left(1+\cos(2\pi(2f_c)t)\right)x(t)$



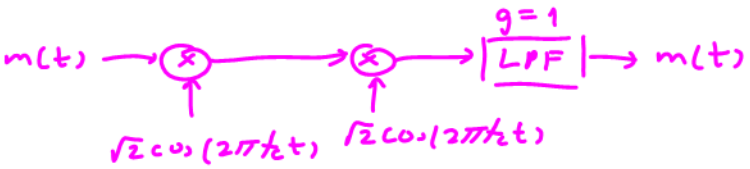
$y(t) = \frac{A_1A_2}{2}x(t) + \frac{A_1A_2}{2}\cos(2\pi(2f_c)t)\,x(t)$



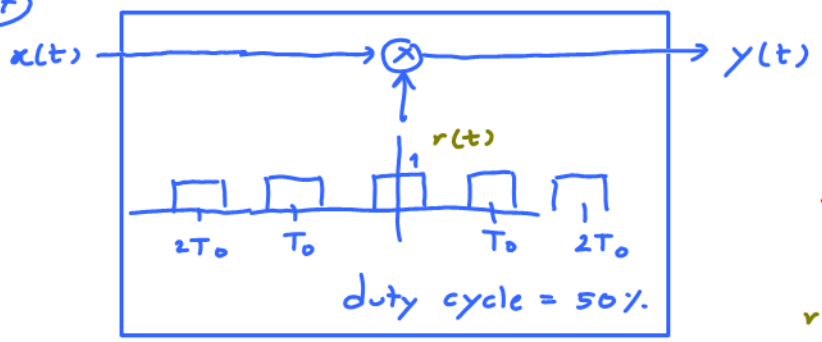


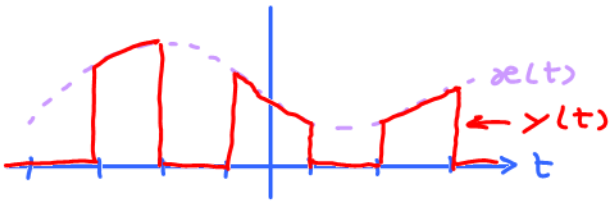


[4.6] Key eqs.



(7)





$r(t) = \frac{1}{2} + \frac{2}{\pi}\cos(2\pi f_0 t) + \left(\frac{-2}{3\pi}\right)\cos(2\pi(3f_0)t) + \cdots$

$y(t) = x(t)\,r(t)$

$= \frac{1}{2}x(t) + \frac{2}{\pi}x(t)\cos(2\pi f_0 t) + \left(\frac{-2}{3\pi}\right)x(t)\cos(2\pi(3f_0)t) + \cdots$

ON-OFF (periodic) switching

duty cycle = 50%.

freq = $f_0 = \frac{1}{T_0}$