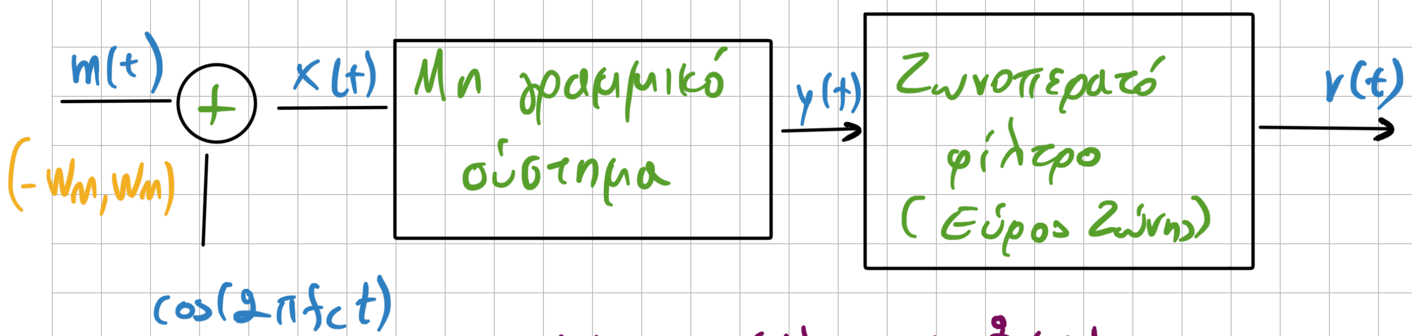
08-04.22

Credits: Κωστής Κατσικόπουλος

$$V_2(t) = \frac{A_c^2}{2}\left[1 + k_a \cdot m(t)\right]^2$$

$$V_3(t) = \frac{A_c}{\sqrt{2}}\left[1 + k_a \cdot m(t)\right]$$



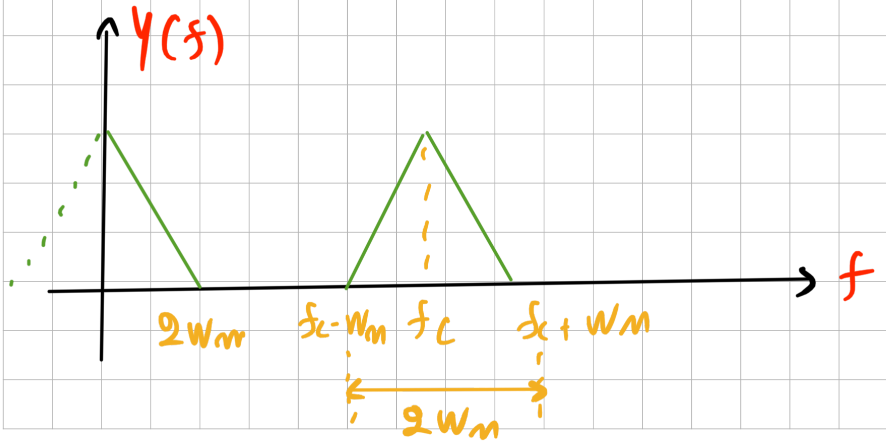
$$y(t) = a\,x(t) + b\,x^2(t)$$

$$y(t) = a\,x(t) + b\,x^2(t) = a\left[m(t) + \cos(2\pi f_c t)\right] +$$

$$+\, b\left[m(t) + \cos(2\pi f_c t)\right]^2 =$$

$$= a\,m(t) + b\,m^2(t) + a\cos(2\pi f_c t) +$$

$$+\, b\cos^2(2\pi f_c t) + 2b\,m(t)\cos(2\pi f_c t)$$



$s_u(t)$ $\hat{s}_u(t)$

CSSB – άνω πλευρικής ζώνης)

Δείξτε ότι:

$$\begin{cases} m(t) = \dfrac{2}{A_c}\left[s_u(t)\cos(2\pi f_c t) + \hat{s}_u(t)\sin(2\pi f_c t)\right] \\ m(t) = \dfrac{2}{A_c}\left[\hat{s}_u(t)\cos(2\pi f_c t) - s_u(t)\sin(2\pi f_c t)\right] \end{cases}$$

(A) $$s_u(t) = \frac{A_c}{2}\left[m(t)\cos(2\pi f_c t) - \hat{m}(t)\sin(2\pi f_c t)\right]$$

(B) $$\hat{s}_u(t) = \frac{A_c}{2}\left[m(t)\sin(2\pi f_c t) + \hat{m}(t)\cos(2\pi f_c t)\right]$$

$$s_u(t)\cos(2\pi f_c t) = \frac{A_c}{2}\left[m(t)\cos^2(2\pi f_c t) - \hat{m}(t)\sin(2\pi f_c t)\cdot\cos(2\pi f_c t)\right]$$

$$\hat{s}_u(t)\sin(2\pi f_c t) = \frac{A_c}{2}\left[m(t)\sin^2(2\pi f_c t) + \hat{m}(t)\cos(2\pi f_c t)\cdot\sin(2\pi f_c t)\right]$$

$\Rightarrow$

$$s_u(t)\cos(2\pi f_c t) + \hat{s}_u(t)\sin(2\pi f_c t) = \frac{A_c}{2}m(t) \Rightarrow$$

$\Rightarrow$

$$\boxed{m(t) = \frac{2}{A_c}\left[s \cdot u(t) \cdot \cos(2\pi f_c t) + \hat{s}\, u(t) \sin(2\pi f_c t) \right]}$$

$\Rightarrow$

- $s \cdot u(t) \sin(2\pi f_c t) = \frac{A_c}{2}\left[m(t) \cos(2\pi f_c t) \sin(2\pi f_c t) - \right.$
  $\left. - \hat{m}(t) \sin^2(2\pi f_c t) \right]$

- $\hat{s} \cdot u(t) \cos(2\pi f_c t) = \frac{A_c}{2}\left[m(t) \cos(2\pi f_c t) \sin(2\pi f_c t) - \right.$
  $\left. + \hat{m}(t) \cos^2(2\pi f_c t) \right]$

(-)

$$\Rightarrow \left[\hat{s}\, u(t) \cos(2\pi f_c t) - s\, u(t) \sin(2\pi f_c t) \right] = \frac{\hat{m}(t) A_c}{2}$$

$\Rightarrow$

$$\boxed{\hat{m}(t) = \frac{2}{A_c}\left[\hat{s} \cdot u(t) \cdot \cos(2\pi f_c t) - s\, u(t) \sin(2\pi f_c t) \right]}$$