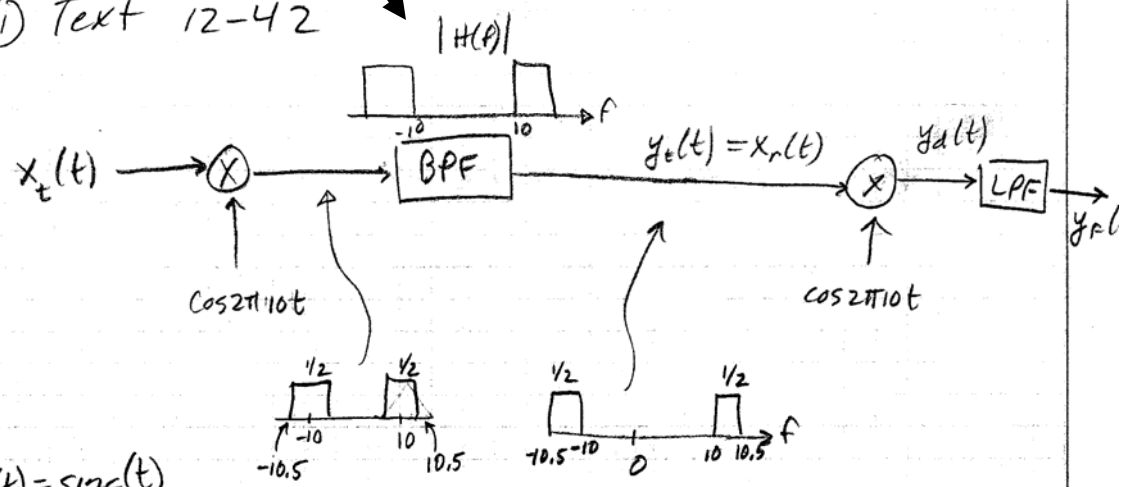
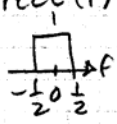
f_m = 0.5 Hz, which is the bandwidth of the message $x(t)$. So this BPF has cutoff frequencies of 10 and 10.5 Hz

① Text 12-42



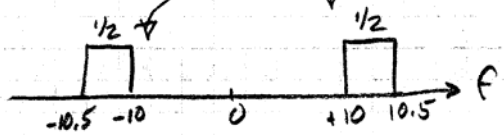
$x_t(t) = \text{sinc}(t)$

$X_t(f) = \text{rect}(f)$

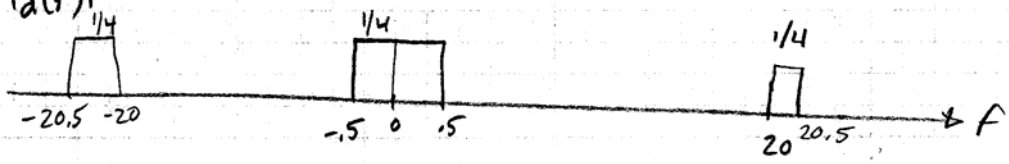


BPF removes lower sideband

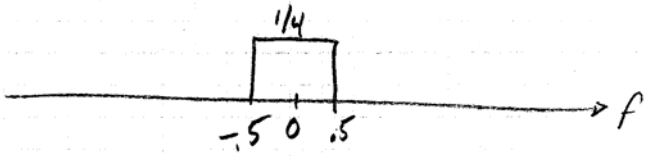
$|Y_t(f)|$



$|Y_d(f)|$

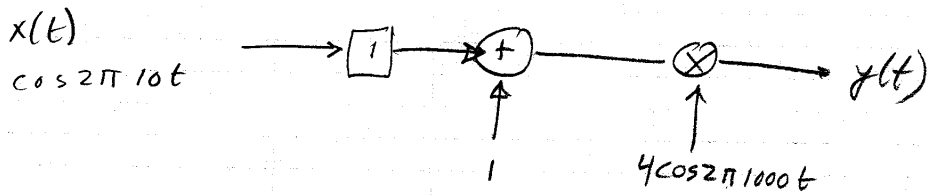


$|Y_r(f)|$



note: phase at each point in system is 0° since all the rectangles are real valued and positive.

(2) Text 12-43.



$$y(t) = [1 + \cos 2\pi 10t] \cdot 4 \cos 2\pi 1000t$$

$$= 4\cos 2\pi 1000t + 4\cos(2\pi 1000t)\cos(2\pi 10t)$$

$$= 4\cos 2\pi 1000t + 4\left[\tfrac{1}{2}\cos(2\pi 1010t) + \tfrac{1}{2}\cos 2\pi 990t\right]$$

$$= 4\cos 2\pi 1000t + 2\cos 2\pi 1010t + 2\cos 2\pi 990t$$

$$P_{carrier} = \frac{4^2}{2} \qquad P_{2avg} = \frac{2^2}{4} \qquad P_{3avg} = \frac{2^2}{4}$$

$$P_{carrier} = \boxed{8\,W} \qquad P_{sidebands} = 2 + 2 = \boxed{4\,W}$$

$$P_{total\ avg} = 8 + 2 + 2 = \boxed{12\,W}$$

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