Gabarito PLOM 2ª chamada 2016.2

① a) $X_1(w) = \int_{-\infty}^{\infty} e^{-2t} u(t-2) e^{-jwt} dt = \int_2^{\infty} e^{-2t} e^{-jwt} dt = \frac{-1}{jw+2} e^{-(jw+2)t} \Big|_{t=2}^{\infty} = \frac{1}{jw+2} e^{-2jw-4}$

b) $Sinc(2t) \xleftrightarrow{\mathcal{F}} \frac{\pi}{2} \Pi(\frac{w}{2}) = \pi/2 \cdot \begin{cases} 1, & |w| \leq 2 \\ 0, & cc \end{cases}$

$X_2(w) = X_1(w) \frac{\pi}{2} \Pi(w/2) = \begin{cases} \frac{\pi}{2} \cdot \frac{1}{jw+2} \cdot e^{-2jw-4}, & |w| \leq 2 \\ 0, & c.c. \end{cases}$

c) $x_3(w) = jw X_2(w) = \begin{cases} j\pi/2 \cdot e^{-4} \cdot \frac{e^{-2jw} \cdot w}{jw+2}, & |w| \leq 2 \\ 0, & c.c \end{cases}$

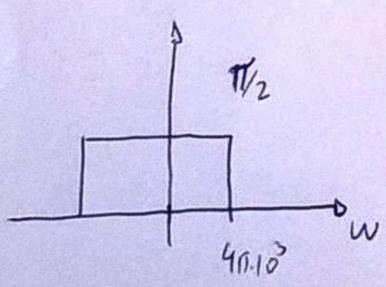
② a) $H(w) = \frac{5jw+12}{(jw)^2+8jw+15} = \frac{5jw+12}{(jw+5)(jw+3)} = \frac{A_1}{jw+5} + \frac{A_2}{jw+3} = \frac{+13/2}{jw+5} - \frac{3/2}{jw+3}$

$h(t) = \frac{13}{2} e^{-5t} u(t) - \frac{3}{2} e^{-3t} u(t)$

b) $Y(w) = H(w) X(w) = \frac{5jw+12}{(jw+5)^2+(jw+3)} = \frac{A_1}{jw+3} + \frac{A_2}{jw+5} + \frac{A_3}{(jw+5)^2} = \frac{-3/4}{jw+3} + \frac{3/4}{jw+5} + \frac{13/2}{(jw+5)^2}$

$y(t) = \frac{-3}{4} e^{-3t} u(t) + \frac{3}{4} e^{-5t} u(t) + \frac{13}{2} t e^{-5t} u(t)$

③

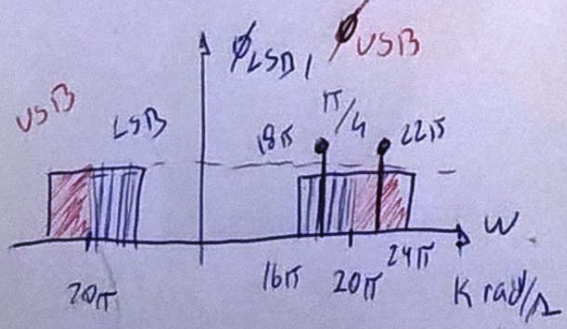


$\pi B \, Sinc(2\pi B t) \xleftrightarrow{\mathcal{F}} \frac{\pi}{2} \Pi(\frac{w}{2\pi B}) = \begin{cases} \pi/2, & |w| \leq 4\pi.10^3 \\ 0, & cc. \end{cases}$

$w_c = 20\pi$ Krad/s

$\varphi_{LSB}(t) = m(t) \cos(w_c t) + m_h(t) Sen(w_c t)$

$\varphi_{USB}(t) = m(t) \cos(w_c t) - m_h(t) Sen(w_c t)$



$m_h(t) = \frac{\pi B Sen(2\pi B t + \pi/2)}{2\pi B t} = \pi B \frac{Cos(2\pi B t)}{2\pi B t}$

$\varphi_{USB}(t) = \pi B \, Sinc(4\pi B t) \cdot \cos(22\pi.10^3 t)$ // (USB)

$\varphi_{LSB}(t) = \pi B \, Sinc(4\pi B t) \cdot \cos(18\pi 10^3 t)$ // (LSB)

④ a) $k_p\, m(t) = 20\sin(1000\pi t) + 10\sin(2000\pi t)$

b) $k_f\, m(t) = \frac{d}{dt}\left\{20\sin(1000\pi t) + 10\sin(2000\pi t)\right\} = 2.10^4\pi\cos(10^3\pi t) + 2.10^4\pi\cos(2.10^3\pi t)$

c) $\Delta f = \frac{k_f\, m_p}{2\pi} = \frac{4.10^4.\pi}{2\pi} = 2.10^4 = 20\,kHz$

d) $\Delta\theta = \max\{\theta(t)\} = 20 + 10 = 30\ rad$

e) $B_N = 2(\Delta f + D) = 2(20k + 1k) =$ [illegible] $42\,kHz$