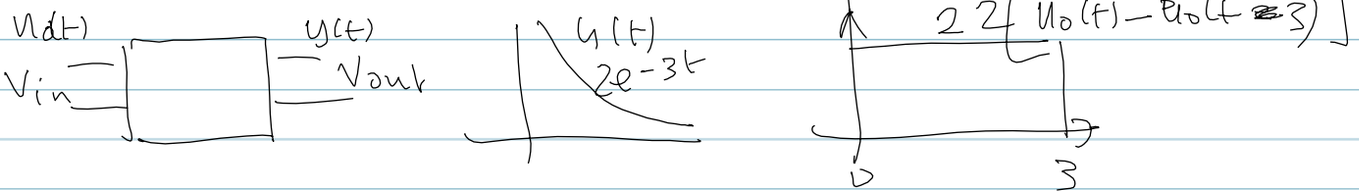
EG-247 Circuit Analysis

Kamis Page 8.34.



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

Try the convolution for Revision

$$u(t) = 2\left[u_0(t) - u_0(t-3)\right]$$

$$u_1(t) = 2u_0(t)$$
$$u_2(t) = -2u_0(t)$$

$$\mathcal{F}\{h(t)\} = \mathcal{F}\{2e^{-3t}\} = H(\omega) = \frac{3}{j\omega+2}$$

$$U_1(\omega) = \mathcal{F}\{2u_0(t)\} = 2\left(\pi\delta(\omega) + \frac{1}{j\omega}\right)$$

$$Y_1(\omega) = H(\omega)U_1(\omega) = \left(\frac{3}{j\omega+2}\right)\left(2\left(\pi\delta(\omega) + \frac{1}{j\omega}\right)\right)$$

(Eq 105)

$$Y_1(\omega) = \frac{6\pi\cdot\delta(\omega)}{j\omega+2} + \frac{6}{j\omega(j\omega+2)}$$

$\frac{6\pi}{j\omega+2} \cdot \delta(\omega)$ → sampling property

$$X(\omega)\delta(\omega) = X(0)\delta(\omega)$$

$$= 3\pi\,\delta(\omega)$$

$$= 1.5\,(2\pi\,\delta(\omega))$$

↓

1.

$$\frac{6\pi}{j\omega+2}\,\delta(\omega) \Longleftrightarrow 1.5.$$

$$\frac{6}{j\omega(j\omega+2)} = \frac{3}{j\omega} - \frac{3}{j\omega+2}$$

$$\mathcal{F}^{-1}\left\{\frac{3}{j\omega} - \frac{3}{j\omega+2}\right\}$$

$$1.5\left(\frac{2}{j\omega}\right) - \frac{3}{j\omega+2}$$

↓

Signum.

$$1.5\,\text{signum}(t) - 3e^{-2t}u_0(t).$$

$$y_1(t) = 1.5 + 1.5\,\text{signum}(t) - 3e^{-2t}u_0(t).$$

signum(t) = $2u_0(t) - 1$

~~$y_1(t) = 1.5^{-} + 1.5^{-}\,3u_0(t) - 1.5^{-}$.~~

$y_1(t) = 1.5^{-} + 1.5^{-}[2u_0(t) - 1] - 3e^{-2t}u_0(t)$

$= 1.5 - 1.5 + 3[1 - e^{-2t}]u_0(t)$

$y_2(t)$ simply replace $u_0(t) \rightarrow -u_0(t-3)$

$= +3[1 - e^{-2t}]u_0(t-3)$ ($t \rightarrow (t-3)$)

$y_1 + y_2 = y = 3[1 - e^{-2t}]u_0(t) - 3[1 - e^{-2(t-3)}]u_0(t-3)$