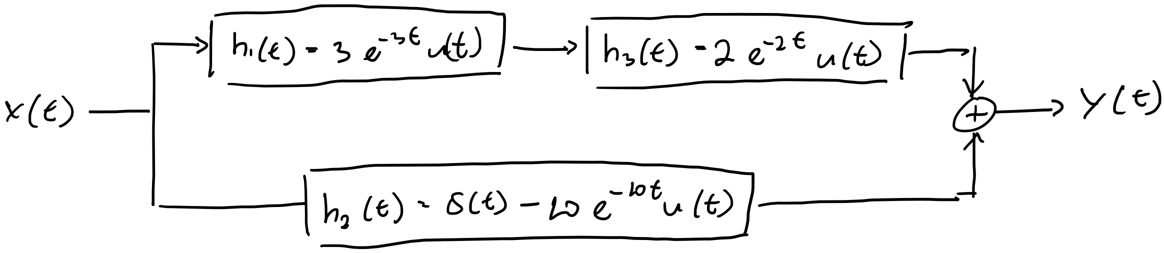
M. Hasyim Abdillah P.
1101191095
TT-43-11

1.



a. $h_A(t) = h_1(t) * h_2(t)$

$H_A(s) = H_1(s) \cdot H_2(s)$

$H_A(s) = 3 \cdot \frac{1}{s+3} \cdot 2\frac{1}{s+2}$

$H_A(s) = \frac{6}{(s+2)(s+3)} \longrightarrow \frac{A}{s+2} + \frac{B}{s+3} = \frac{(A+B)s + 3A + 2B}{(s+2)(s+3)}$

$3A + 2B = 6 \quad | \times 1$
$A + B = 0 \quad | \times 2$

$3A + 2B = 6$
$2A + 2B = 0$ $-$
$A = 6$
$B = -6$

$H_A(s) = \frac{6}{s+2} - \frac{6}{s+3}$

$h_A(t) = 6e^{-2t}u(t) - 6e^{-3t}u(t)$

b. $h_2(t) = \delta(t) - 10e^{-10t} \cdot u(t)$

$H_2(s) = 1 - 10 \cdot \frac{1}{s+10}$

$H_2(s) = \frac{s+10-10}{s+10}$

$H_2(s) = \frac{s}{s+10}$

c. $h(t) = h_2(t) + h_A(t)$

$h(t) = \delta(t) - 10e^{-10t}u(t) + 6e^{-2t}u(t) - 6e^{-3t}u(t)$

d. $h(t) = \delta(t) - 10e^{-10t} + 6e^{-2t}u(t) - 6e^{-3t}u(t)$

$$H(s) = 1 - \frac{10}{s+10} + \frac{6}{s+2} - \frac{6}{s+3}$$

$$H(s) = \frac{s}{s+10} + \frac{6}{(s+2)(s+3)}$$

$$H(s) = \frac{s(s+2)(s+3) + 6(s+10)}{(s+2)(s+3)(s+10)} = \frac{s^3 + 5s^2 + 12s + 60}{(s+2)(s+3)(s+10)}$$

Pole :

$s + 2 = 0$

$s_1 = -2$

$s + 3 = 0$

$s_2 = -3$

$s + 10 = 0$

$s_3 = -10$

Zero :

$s^3 + 5s^2 + 12s + 60 = 0$

$s^2(s+5) + 12(s+5) = 0$

$(s^2 + 12)(s+5) = 0$

$s + 5 = 0$

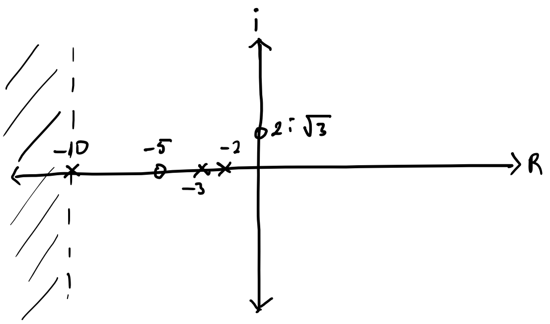
$s_1 = -5$

$s^2 + 12 = 0$

$s^2 = -12$

$s_2 = i\sqrt{12} = 2i\sqrt{3}$

e.



o : Zero

x : Pole

$-10e^{-10t}u(t) \rightarrow Re_1(s) < -10$

$6e^{-2t}u(t) \rightarrow Re_2(s) > -2$

$-6e^{-3t}u(t) \rightarrow Re_3(s) < -3$

Semua daerah konvergensi condong ke arah kiri ($Re(s) < 0$), maka :

$ROC = Re(s) < -10$

$$x(t) = 2e^{-4t}\,u(t) \longrightarrow X(s) = \frac{2}{s+4}$$

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

$$Y(s) = X(s) \cdot H(s)$$

$$Y(s) = \frac{2}{s+4} \cdot \frac{s(s+2)(s+3) + 6(s+10)}{(s+2)(s+3)(s+10)}$$

$$Y(s) = \frac{2s(s+2)(s+3) + 12(s+10)}{(s+2)(s+3)(s+4)(s+10)}$$