Auto
TD1
(1)

Ex 1

1/ $\dot{y}(t) + 2y(t) = \Gamma(t)$

$s.Y(s) - y(0) + 2Y(s) = \frac{1}{s}$

$(s+2)Y(s) = \frac{1}{s} + 1$

$Y(s) = \frac{1}{s(s+2)} + \frac{1}{s+2}$

$y(t) = \left(\frac{1}{2}(1 - e^{-2t}) + e^{-2t}\right)\Gamma(t)$

$= \frac{1}{2}(1 + e^{-2t})\Gamma(t)$

2/ $\ddot{y}(t) + 10\dot{y}(t) + 16y(t) = 10\delta(t)$

$s^2.Y(s) + 10.s.Y(s) + 16Y(s) = 10$

$Y(s)(s^2 + 10s + 16) = 10$

$Y(s) = \frac{10}{s^2 + 10s + 16}$

$$Y(s) = \frac{10}{s^2 + 10s + 16}$$

$$= \frac{10}{(s+8)(s+2)}$$

$$= \frac{A}{s+8} + \frac{B}{s+2}$$

$$= \frac{-10}{6(s+8)} + \frac{10}{6(s+2)}$$

$$= \frac{10}{6}\left(\frac{-1}{s+8} + \frac{1}{s+2}\right)$$

$$y(t) = \frac{10}{6}\left(-e^{-8t} + e^{-2t}\right)\Gamma(t)$$

* $$Y(s) = \frac{s+1}{s(s+2}$$

$$= \frac{A}{s} + \frac{B}{s+2}$$

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

$$= \frac{1}{2}\left(\frac{1}{s} + \frac{1}{s+2}\right)$$

$$y(t) = \frac{1}{2}\left(1 + e^{-2t}\right)\Gamma(t),$$

Ex 2

Auto
TD 1

1/ $\dot{h}(t) + a\,h(t) = b\,q_e(t)$ (2)

$s.H(s) + a\,H(s) = b.Q_e(s)$

$$G(s) = \frac{H(s)}{Q_e(s)} = \frac{b}{s+a}$$

$Q_e(s) \rightarrow \boxed{G(s)} \rightarrow H(s)$

2/ order : 1
gain : b/a
poles : $-a$
zeros : ✗

Ex 3

$LC.s^2.V_s(s) + RC.s.V_s(s) + V_s(s) = V_e(s)$

$$G(s) = \frac{V_s(s)}{V_e(s)} = \frac{1}{LCs^2 + RCs + 1}$$

$$G(s) = \frac{1}{LC.s^2 + RC.s + 1}$$

$V_e(s) \rightarrow \boxed{G(s)} \rightarrow V_s(s)$

2/ ordre : 2

gain : 1

Poles : s_1 et s_2

zeros : ∞

Ex 4

$$m s^2 Y(s) + b s Y(s) + k Y(s) = U(s)$$

$$G(s) = \frac{Y(s)}{U(s)} = \frac{1}{ms^2 + bs + k}$$

$$= \int_{-\infty}^{+\infty} g(t-\tau)\, u(\tau)\, d\tau.$$

$y(t) = \mathcal{L}^{-1}(G(s) \cdot U(s)) = g(t) * U(t)$

$U(s) \rightarrow \boxed{G(s)} \rightarrow Y(s)$

ordre : 2 poles : s_1 et s_2

gain st : $\frac{1}{k}$ zeros : ∞

$\Delta = (RC)^2 - 4LC$ si $\Delta > 0$

$s_1 = \frac{-RC - \sqrt{(RC)^2 - 4LC}}{2LC}$ $s_2 = \frac{-RC + \sqrt{(RC)^2 - 4LC}}{2LC}$

si $\Delta = 0$ $s = \frac{-RC}{2LC}$

$\Delta = b^2 - 4mk$

$\Delta > 0$ $s_1 = \frac{-b - \sqrt{b^2 - 4mk}}{2m}$ $s_2 = \frac{-b + \sqrt{b^2 - 4mk}}{2m}$

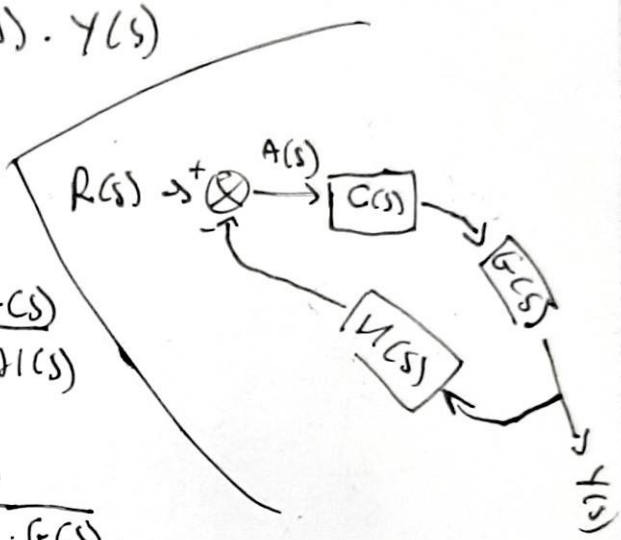
Auto TD1 (3)

Exs

$$Y(s) = A(s) \cdot C(s) \cdot G(s)$$

$$A(s) = R(s) - H(s) \cdot Y(s)$$

$$Y(s) = (R(s) - H(s) \cdot Y(s)) \cdot C(s) \cdot G(s)$$



$$Y(s) = \frac{R(s) \cdot C(s) \cdot G(s)}{1 + C(s) \cdot G(s) \cdot H(s)}$$

$$F(s) = \frac{C(s) \cdot G(s)}{1 + C(s) \cdot H(s) \cdot G(s)}$$

$$Y(s) = R(s) \cdot F(s)$$

AN : $$F(s) = \frac{1/s \cdot \frac{10}{s+5}}{1 + \frac{1}{s} \cdot \frac{10}{s+5} \cdot \frac{1}{s+1}}$$

$$= \frac{\frac{10}{s^2+5s}}{1 + \frac{10}{(s^2+5s)(s+1)}}$$

$$= \frac{10/(s^2+5s)}{1 + \frac{10}{s^3+6s^2+5s}}$$

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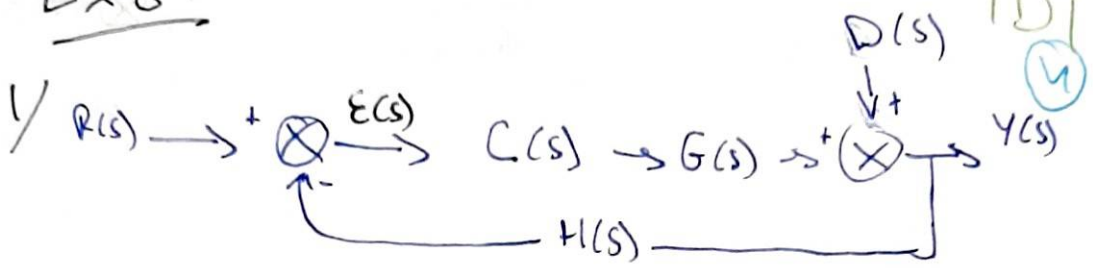
Auto TD

Ex6

1/



* $E(s) = R(s) - Y_1(s).H(s)$

$Y_1(s) = E(s).C(s).G(s)$

$Y_1(s) = [R(s) - Y_1(s).H(s)].C(s).G(s)$

$$Y_1(s) = \frac{R(s).C(s).G(s)}{1 + H(s).C(s).G(s)}$$

$$\frac{Y_1(s)}{R(s)} = T(s) = \frac{C(s).G(s)}{1 + C(s).G(s).H(s)}$$

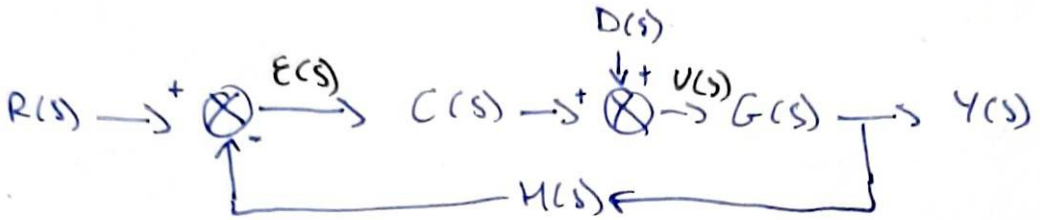
* $E(s) = -Y(s).H(s)$

$Y(s) = E(s).C(s).G(s) + D(s)$

$Y(s) = D(s) - Y(s).H(s).C(s).G(s)$

$$Y(s) = \frac{D(s)}{1 + H(s).C(s).G(s)}$$

$$\frac{Y(s)}{D(s)} = S(s) = \frac{1}{1 + C(s).G(s).H(s)}$$



* $E(s) = R(s) - Y(s) \cdot H(s)$

$U(s) = E(s) \cdot C(s)$

$Y(s) = U(s) \cdot G(s)$

$= G(s) \cdot E(s) \cdot C(s)$

$= G(s) \cdot C(s)(R(s) - Y(s) \cdot H(s))$

$$= \frac{G(s) \cdot C(s) \cdot R(s)}{1 + G(s) \cdot C(s) \cdot H(s)}$$

$$T(s) = \frac{Y(s)}{D(s)} = \frac{C(s) \cdot G(s)}{1 + C(s) \cdot G(s) \cdot H(s)}$$

* $E(s) = -Y(s) \cdot H(s)$

$U(s) = D(s) + E(s) \cdot C(s)$

$Y(s) = U(s) \cdot G(s)$

$= G(s)(D(s) - Y(s) \cdot H(s) \cdot C(s))$

$$= \frac{G(s) \cdot D(s)}{1 + G(s) \cdot H(s) \cdot C(s)}$$

$$\frac{Y(s)}{D(s)} = S(s) = \frac{G(s)}{1 + C(s) \cdot G(s) \cdot H(s)}$$