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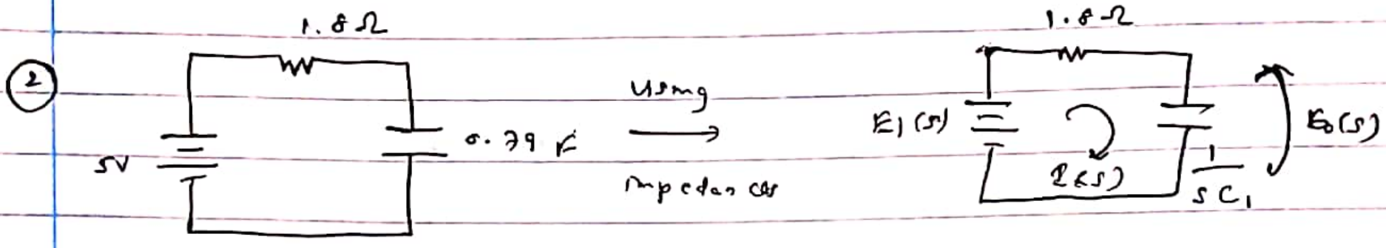
EN 3143 180066F

MATLAB Exercise 03

(2)



Using KVL ; $E_1(s) = I(s) \times \left[1.8 + \frac{1}{s \times 0.79} \right]$ — (1)

$E_0(s) = I(s) \times \frac{1}{s \times 0.79}$ — (2)

Therefore ; $\frac{E_0(s)}{E_1(s)} = \frac{\frac{1}{s \times 0.79}}{1.8 + \frac{1}{0.79s}} = \frac{\frac{1}{0.79s} \times 0.79s}{1.8 \times 0.79s + 1}$

$TF = \frac{1}{1 + 1.422s} = \frac{0.703235}{s + 0.703235}$

Therefore, (First order sys)

Time constant ; $T = \frac{1}{0.703235} = 1.422\ s$

Rise Time ; $T_r = 2.2T = 3.1284\ s$

Settling Time , $T_s = 4T = 5.688\ s$

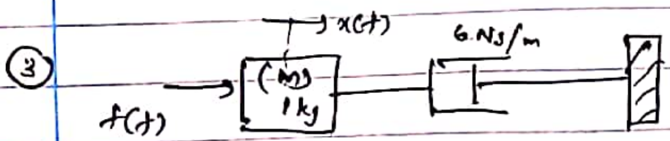
At steady state,

$V_c(\infty) = 5V$

$\therefore V_c(t) = 5(1 - e^{-0.703t})$

$t \geq 0$

(3)



$f(t) - 6(\dot{x}(t)) = M\ddot{x}(t)$ — (1)

$F(s) = [s^2 M + 6s] X(s)$

$\frac{X(s)}{F(s)} = \frac{1}{s(Ms+6)} = \frac{1}{s} \cdot \frac{1}{Ms+6}$

When $M = 1$, $\frac{X(s)}{F(s)} = \frac{1}{s} \cdot \frac{1}{s+6}$

When $M = 1$; $\frac{X(s)}{F(s)} = \frac{1}{s(s+6)}$

From ① ; $f(t) = 6\dot{x}(t) + M\ddot{x}(t)$

If $\dot{x}(t) = y(t)$, assuming zero initial conditions,

$\ddot{x}(t) = \dot{y}(t)$,

Therefore ; $f(t) = 6y(t) + M\dot{y}(t)$

taking laplace, $F(s) = 6Y(s) + MsY(s)$

$$\frac{Y(s)}{F(s)} = \frac{1}{6 + Ms} \quad \text{—— ②}$$

When $M = 1$, $\frac{Y(s)}{F(s)} = \frac{1}{s+6} = \frac{1}{6} \cdot \frac{6}{s+6}$

$T = \frac{1}{6} = 0.167\ s$

$T_s = 4/6 = 0.667\ s$

$T_r = 2.2 \times 1/6 = 0.367\ s$

② $\Rightarrow$ $\frac{Y(s)}{F(s)} = \frac{1/M}{6/M + s}$ $\Rightarrow$ $T = \frac{1}{6/M} = M/6$

$T_s = 4T = 0.667M$

$T_r = 2.2T = 0.367M$

$M = 2$; $T = 1/3 = 0.333\ s$

$T_s = 4/3 = 1.333\ s$

$T_r = 2.2T = 0.733\ s$