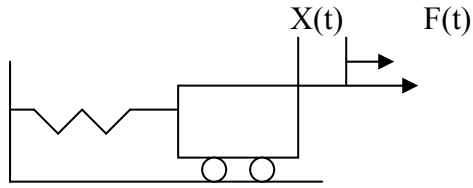


1. Za dan sistem določi pomik $x(t)$.



Podatki:

$$M(\text{masa})=1 \text{ kg}$$

$$K(\text{vzmet})=100 \text{ N/m}$$

$$P_o=50 \text{ N}$$

$$w(\text{omega})=5 \text{ rd/s}$$

Začetni pogoji:

$$X(t=0)=0$$

$$X'(t=0)=0$$

$$F(t)=P_o \cdot \sin(wt)$$

Določi $X(t)$!

Rešitev:

$$(M D^2 + K)X = F(t) = P_o \cdot \sin(wt)$$

Uporabimo L-transformacijo:

$$L[D^2 X(t)] = s^2 X(s) - S \cdot x(0) - dx/dt(0) = s^2 X(s)$$

$$L[X(t)] = X(s)$$

$$L[\sin(wt)] = w / (s^2 + w^2)$$

$$X(s) \{M \cdot s^2 + K\} = P_o \cdot w / (s^2 + w^2)$$

Uporabimo metodo ekspanzije ulomkov:

$$X(s) = (As + b) / (M \cdot s^2 + K) + (Cs + D) / (s^2 + w^2)$$

$$s^3: A + CM = 0$$

$$s^2: BM + D = 0$$

$$s: AK + Cw^2 = 0$$

$$1: BK + Dw^2 = P_o \cdot w$$

Sledi:

$$A = 0$$

$$B = (P_o \cdot w) / (K - Mw^2)$$

$$D = P_o \cdot w \cdot M / (Mw^2 - K)$$

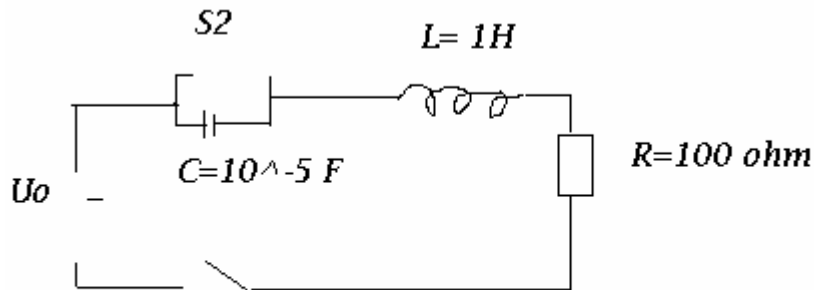
Urediš in inverzno L- izvedeš! Glej v tabelo!

2. Domača naloga

Določi $i(t)$, če veš da je S1 sklenjeno oziroma:

- a) S2 nesklenjeno stikalo
- b) S2 sklenjeno stikalo

Slika:



Podatki:

$$U_0 = 30 \text{ V}$$

$$a) U_c + U_l + U_r - U_0 = 0$$

$$1/[CD] * i(t) + LDi(t) + Ri(t) = U_0 \quad /*CD$$

$$i(t) * [1 + LCD^2 + RCD] = U_0 CD$$

$$t \rightarrow D \rightarrow s$$

Po L- transformaciji dobimo:

$$I(s) = [1]/[LCs^2 + RCs + 1] * [Cs]/[s]$$

$$I(s) = [10^{-5}] * 30 / [10^{-5} s^2 + 10^{-3} s + 1] \quad /*10^{-5}$$

$$I(s) = 1 * 30 / [s^2 + 100s + 10^5]$$

Pogledamo v tabelo, če je kaj podobnega:

$$\frac{1 \cdot 30}{(s + 50)^2 - 2500 + 10^5} =$$

$$\frac{312,25}{(s + 50)^2 + (312,25)^2} * \frac{30}{312,25} =$$

Po L- inverzni transformaciji

$$= \frac{30}{312,25} * e^{-50t} * \sin(312,25t)$$

Za b) primer: S2 sklenjeno

$$U_l + U_r = U_0$$

$$L \frac{di(t)}{dt} + R i(t) = U_0$$

$$I(t) * (L \frac{d}{dt} + R) = U_0$$

$$t \rightarrow D \rightarrow s$$

$$I(s) = U_0/s * 1/(Ls + R)$$

$$I(s) = \frac{A}{s} + \frac{B}{Ls + R}$$

$$A = \frac{U_0}{R} = \frac{3}{10}$$

$$B = -A = -\frac{3}{10}$$

$$I(s) = \frac{3}{10} * \frac{1}{s} - \frac{3}{10} * \frac{1}{L} * \frac{1}{s + \frac{R}{L}}$$

Vstavimo številke in izvedemo L-
inverzno transformacijo

$$I(t) = 0.3 - 0.3 e^{-100t}$$

Za vajo lahko narediš naslednje primere:

Primer 1:

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

G(s).....je podan

X(t).....je podan

$$G(s) = \frac{5s^2 - 15s - 11}{(s-2)^3}$$

$$x(t) = e^{-t}$$

Primer 2:

$$\ddot{x} + 2\dot{x} + 5x = 10$$

$$\text{začetni pogoji : } \dot{x}(0) = -4; x(0) = 0$$

Primer 3:

$$\ddot{y} + 2\dot{y} + 5y = e^{-t} * \sin(t)$$

$$ZP : y(0) = 0 ; \dot{y}(0) = 1$$

Primer 4:

$$y(t) = \frac{1}{D^2 + 2D - 3} * t^2$$

Primer 5:

$$y(t) = \frac{1}{D^2 + 5D + 6} * x(t) \quad x(t) = t$$

Primer 6:

$$\frac{i(D)}{v(D)} = \frac{D+2}{(D^2 + 5D + 4)(D+2)^2}$$

Primer 7:

$$\frac{i(D)}{v(D)} = \frac{2(D+2)}{(D^2 + 5D + 13)}$$

Primer 8:

$$\frac{i(D)}{v(D)} = \frac{15D}{D^2 + 3D + 8}$$