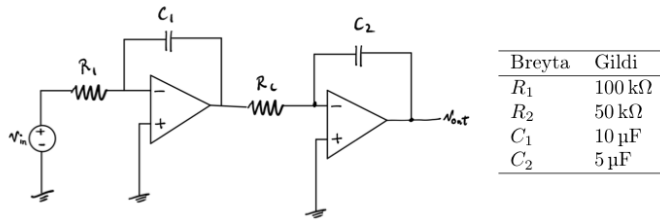


Dæmi 1 – Prep- og ímpúlssvörun

Finnið prep- og ímpúlssvörun rásinnar hér að neðan. Gerið ráð fyrir fullkomnum aðgerðarmögnurum.

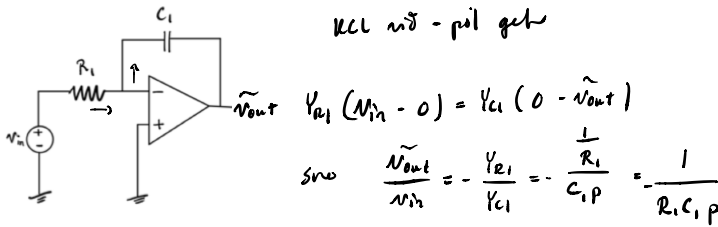


Fyrir fullkomna aðgerðarmagnu gildir að $v^- = v^+$ & $i^- = i^+ = 0$ A

Í rásinni hér að ofan er $v^+ = 0$ V svo $v^- = 0$ V líka. Vegna þess að N_{out} & i_{out} eru hafið v^+ & v^- , getur við skipt rásinni upp í tvennt

$$Z_R = R \quad Z_C = \frac{1}{Cp}$$

$$Y_R = \frac{1}{R} \quad Y_C = Cp$$



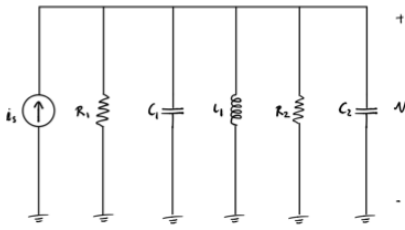
$$\text{Þá er } \frac{v_{out}}{v_{in}} = \left(- \frac{Y_{R1}}{Y_{C1}} \right) \left(- \frac{Y_{R2}}{Y_{C2}} \right) = \frac{1}{R_1 R_2 C_1 C_2 p^2} = \frac{4}{p^2}$$

$$\text{prep-svörun er þá } h_{out} = \frac{4}{p^2} (u(t+1)) = \frac{4}{p} (t u(t+1)) = \underline{\underline{4 \left(\frac{1}{2} t^2 u(t+1) \right) = 2 t^2 u(t)}}$$

$$\text{Ímpúlssvörun er } \underline{\underline{h'_{out} = 4 t u(t)}}$$

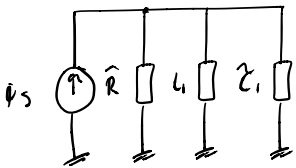
Dæmi 2

Finnið $v(t)$ ef $i_s(t) = 12 \cos(2t)$.



Breyta	Gildi
R_1	1Ω
R_2	2Ω
L_1	$1/12 \text{ H}$
C_1, C_2	1 F

Set $\tilde{R} = R_1 \parallel R_2 = \frac{2}{3} \Omega$ $\tilde{C} = C_1 \parallel C_2 = 2 \text{ F}$ Innmarki er $i_s(t) = 12 \cos(\omega_0 t)$, $\omega_0 = 2$



þá er $Z_R(\omega) = \frac{2}{3}$ $Z_C(\omega) = \frac{1}{4j}$ $Z_L(\omega) = \frac{1}{6}j$

Svo $Z_{eq}(\omega) = \left(\frac{1}{Z_R(\omega)} + \frac{1}{Z_C(\omega)} + \frac{1}{Z_L(\omega)} \right)^{-1}$

$$= \left(\frac{3}{2} + \frac{6}{j} + 4j \right)^{-1} = \left(\frac{3}{2} - 6j + 4j \right)^{-1}$$

$$= \left(\frac{3}{2} - 2j \right)^{-1} = \left(\frac{3 - 4j}{2} \right)^{-1} = \frac{2}{3 - 4j}$$

$$= \frac{6}{25} + \frac{8}{25}j \approx 0.4 \angle 53.13^\circ$$

nú er $I(j\omega) = 12 \angle 0^\circ$

$$V(j\omega) = I(j\omega) Z_{eq}(j\omega) = (12 \angle 0^\circ)(0.4 \angle 53.13^\circ)$$

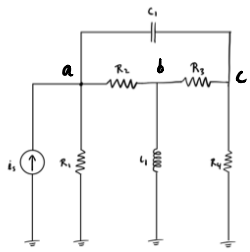
$$= 4.8 \angle 53.13^\circ$$

$$\underline{\underline{v(t) = 4.8 \cos(2t + 53.13^\circ)}}$$

Dæmi 3

Finnið spennuna $v(t)$, fyrir R_2 , ef gefið er að $i_s(t) = 12 \cos(2t + 30^\circ)$. Hér er sniðugt að nota MNA og setja $i_s(t)$ á vísaform.

$$\text{Höfnum } I_s(j\omega) = 12 \angle 30^\circ \text{ en } \omega = 2$$



Breyta	Gildi
R_1, R_2, R_3	1Ω
R_4	2Ω
C_1	2 F
L_1	2 H

$$\text{Höfnum } Y_R(j\omega) = \frac{1}{R} \quad Y_C(j\omega) = Cj\omega \quad \& \quad \text{stillum vpp í mna}$$

$$\begin{matrix} & a & b & c \\ \begin{matrix} a \\ b \\ c \end{matrix} & \begin{bmatrix} Y_{R1} + Y_{R2} + Y_{C1} & -Y_{R2} & -Y_{C1} \\ -Y_{R2} & Y_{R1} + Y_{R3} + Y_{C1} & -Y_{R3} \\ -Y_{C1} & -Y_{R3} & Y_{C1} + Y_{R3} + Y_{R4} \end{bmatrix} \end{matrix} \begin{bmatrix} v_a \\ v_b \\ v_c \end{bmatrix} = \begin{bmatrix} i_s \\ 0 \\ 0 \end{bmatrix} \quad \text{eða} \quad \begin{bmatrix} v_a \\ v_b \\ v_c \end{bmatrix} = \hat{v}_s \begin{bmatrix} 0.6384 + 0.0738i \\ 0.608997 + 0.19146i \\ 0.62745 + 0.15687i \end{bmatrix}$$

$$V(j\omega) = v_a(j\omega) - v_b(j\omega) = I(j\omega) \begin{pmatrix} 0.0294 - 0.11765i \end{pmatrix} = (12 \angle 30^\circ) (0.1213 \angle -75.96^\circ)$$

$$\underline{\underline{v(t) = 1.455 \cos(2t - 45.96^\circ)}}$$