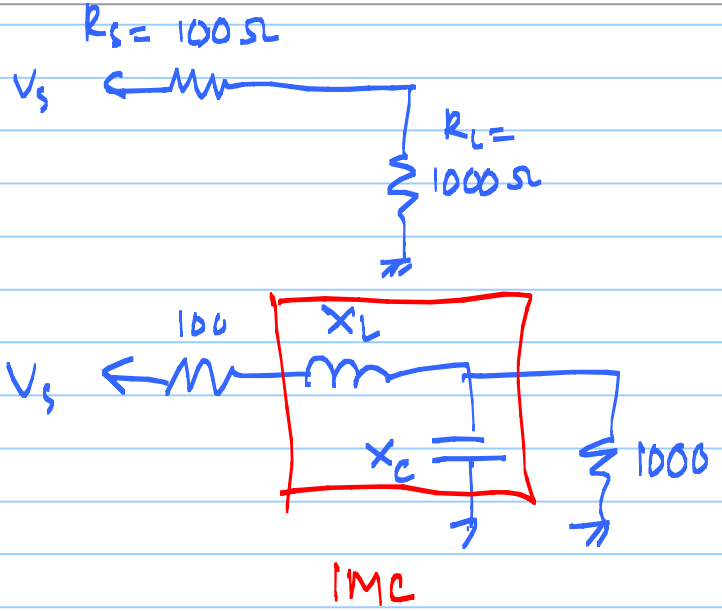
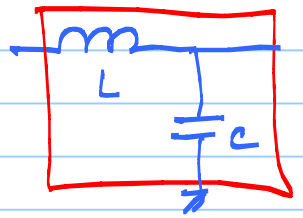
Rancang suatu IMC bentuk "L" yang menyepadankan Rs = 100Ω dan RL = 1KΩ pada f = 100MHz, dengan sifat meloloskan sinyal DC.



Karena $R_S < R_L$ maka IMC L kanan dan meloloskan DC → LPF



IMC L Kanan

$$Q_p = Q_s = \sqrt{\frac{R_p}{R_s} - 1} = \sqrt{\frac{1000}{100} - 1} = 3$$

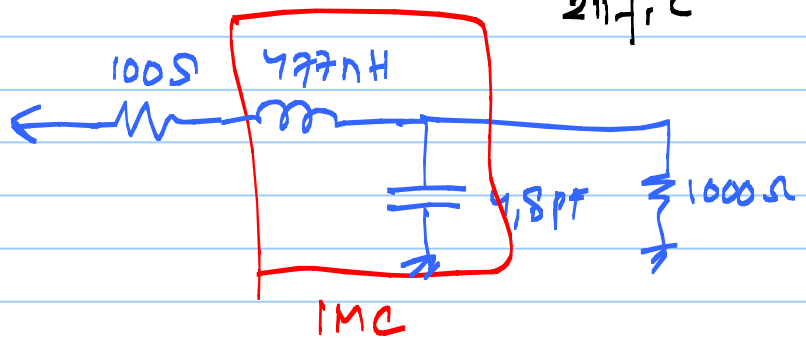
$$Q_s = \frac{X_s}{R_s} = \frac{X_L}{100} \rightarrow X_L = 3 \times 100 = 300\,\Omega$$

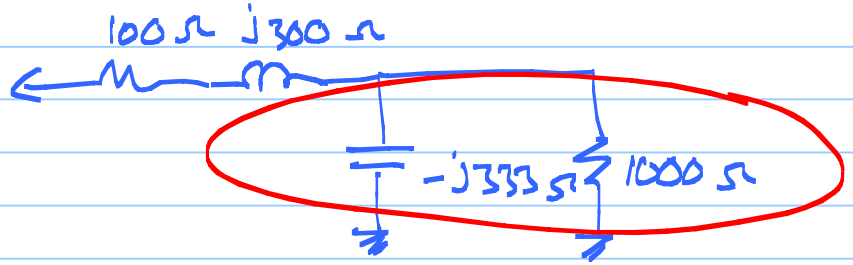
$$2\pi f_r L = 300$$

$$L = \frac{300}{2\pi \cdot 100.10^6} = 477\ nH$$

$$Q_p = \frac{R_p}{X_p} = \frac{1000}{X_C} \rightarrow X_C = \frac{1000}{3} = 333$$

$$\frac{1}{2\pi f_1 C} = 333 \rightarrow C = \frac{1}{2\pi \cdot 100 \cdot 10^6 \cdot 333} = 4{,}8\,pF$$





$$Z_p = \frac{1000 \times (-j333)}{1000 - j333} = \frac{1606 \cdot 333 \angle -90^\circ}{1053{,}99 \angle -18{,}42^\circ}$$

$$= 315{,}94 \angle -71{,}57$$

$$= 99{,}88 - j299{,}74$$

$Z_s = 100 + j300$

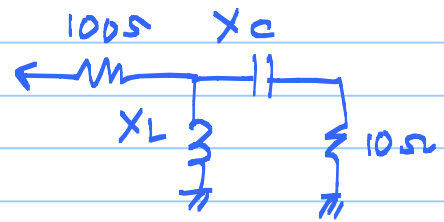
$Z_p = 99{,}88 - j299{,}74$

$Z_s = Z_p^*$

Rancang IMC bentuk L di frekuensi 10 MHz yg meloloskan frekuensi tinggi dengan $R_S = 100\Omega$ dan $R_L = 10\Omega$

Jawab:

$R_S > R_L \rightarrow$ IMC L konan HPF



$$Q = \sqrt{\frac{100}{10} - 1} = 3$$

$$Q_p = \frac{R_p}{X_p} \rightarrow X_p = \frac{R_p}{Q_p} \Rightarrow X_L = \frac{R_S}{Q} = \frac{100}{3} = 33.3$$

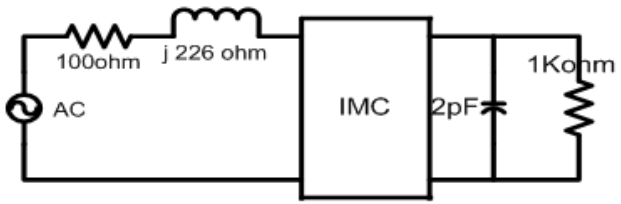
$$L = \frac{33.3}{2\pi f} = \frac{33.3}{2\pi\, 10.10^6} = 530,5\ nH$$

$$Q_S = \frac{X_S}{R_S} \Rightarrow X_S = Q_S \times R_S$$

$$X_C = Q \times R_L = 3 \times 10 = 30$$

$$C = \frac{1}{30 \times 2\pi f} = 530,5\ pF$$

Dengan menggunakan metode absorpsi, rancanglah IMC bentuk "L" pada 100MHz dengan sifat meloloskan sinyal DC pada rangkaian berikut:



$$Q_p = Q_s = \sqrt{\frac{R_p}{R_s} - 1} = \sqrt{\frac{1000}{100} - 1} = 3$$

$$Q_s = \frac{X_s}{R_s} \rightarrow X_s = 3 \times 100 = 300$$

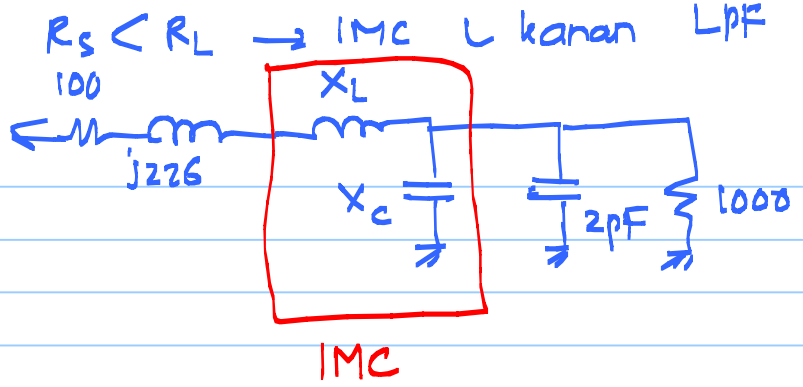
$$X_L = X_s - j226 = j300 - j226$$

$$= j74$$

$$2\pi f_r L = 74$$

$$L = \frac{74}{2\pi \cdot 100 \cdot 10^6} = 117\ nH$$

$R_s < R_L \rightarrow$ IMC L kanan LPF



$$Q_p = \frac{R_p}{X_p} \Rightarrow X_p = \frac{1000}{3} = 333$$

$$\frac{1}{2\pi f_r C} = 333 \rightarrow C = \frac{1}{333 \cdot 2\pi \cdot 100 \cdot 10^6}$$

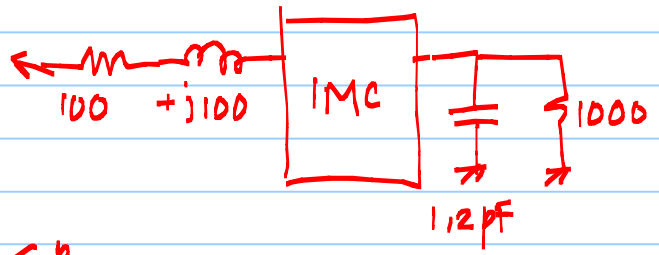
$$C = 4{,}8\ pF$$

$$C_\pi = 2pF + C_p$$

$$C_p = 4{,}8\ pF - 2\ pF = 2{,}8\ pF$$

Rancang IMC yg meloloskan sinyal DC di $f = 25$ MHz dengan impedansi sumber sebesar $(100 + j100)\ \Omega$ dan impedansi beban output $1000\ \Omega$ dan 1,2 pF paralel.

Jawab :



$$Q = \sqrt{\frac{1000}{100} - 1} = 3$$

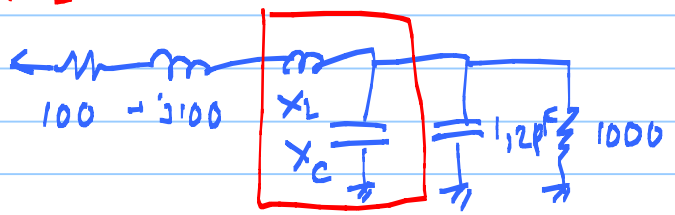
$$Q_s = \frac{X_s}{R_s} \Rightarrow X_s = Q_s \times R_s = Q \times 100 = 300$$

$$X_{Lt} = 300$$

$$X_L = 300 - 100 = 200\ \Omega$$

$$L = \frac{200}{2\pi f} = \frac{200}{2\pi \cdot 25 \cdot 10^6} = 1{,}27\ \mu H$$

$R_s < R_L$



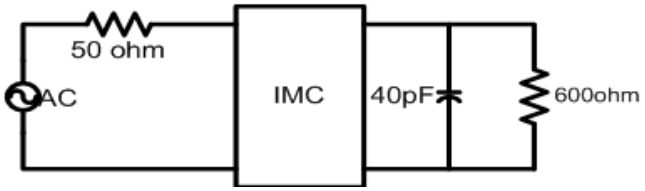
IMC L kiri
LPF

$$Q_p = \frac{R_p}{X_p} \Rightarrow X_p = \frac{R_p}{Q} = \frac{1000}{3} = 333{,}3$$

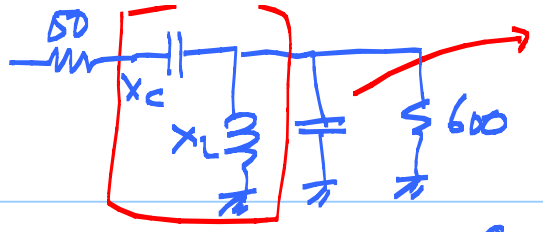
$$C_t = \frac{1}{333{,}3 \times 2\pi f} = 19{,}1\ pF$$

$$C = 19{,}1\ pF - 1{,}2\ pF = 17{,}9\ pF$$

Rancanglah suatu IMC yang dapat memblock sinyal DC antara beban-sumber rangkaian dibawah ini, pada frekuensi operasi 75 MHz. Gunakan metode [redacted] absorbsi



Solusi:



IMC L Ckt : HPF

$X_C = \frac{1}{\omega C} = \frac{1}{2\pi f C}$

$= 53\ \Omega$

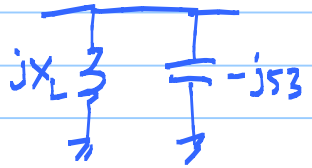
$Q = \sqrt{\frac{600}{50} - 1} = 3,32$

$Q_S = \frac{X_S}{R_S} \Rightarrow X_S = Q_S \times R_S$

$X_C = Q \times 50 = 166$

$C = \frac{1}{2\pi f\, 166} = 12,78$ pF

$Q_P = \frac{R_P}{X_P} \Rightarrow X_P = \frac{R_P}{Q_P} = \frac{600}{3,32} = 180,7$



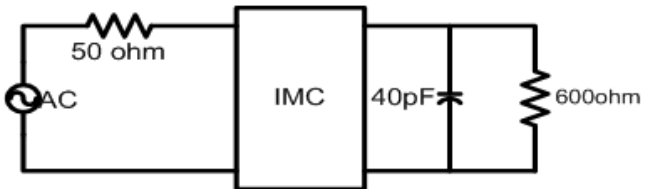
$\Rightarrow j180,7 = \frac{jX_L \times (-j53)}{jX_L - j53} = \frac{53X_L}{j(X_L - 53)}$

$-180,7(X_L - 53) = 53X_L$

$-180,7X_L + 9577,1 = 53X_L$

$X_L = \frac{9577,1}{53 + 180,7} = 40,98 \Rightarrow L = \frac{40,98}{2\pi f} = 86,9$ nH

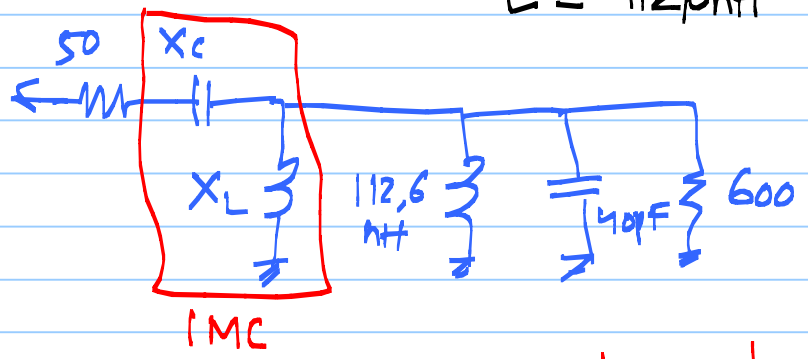
Rancanglah suatu IMC yang dapat memblock sinyal DC antara beban-sumber rangkaian dibawah ini, pada frekuensi operasi 75 MHz. Gunakan metode resonansi.



Solusi:

$$f_r = \frac{1}{2\pi\sqrt{LC}} \rightarrow L = \frac{1}{\omega_r^2 C} = \frac{1}{(2\pi 75.10^6)^2 . 40.10^{-12}}$$

$$L = 112{,}6\,nH$$



$$Q_p = Q_s = \sqrt{\frac{R_p}{R_s} - 1} = \sqrt{\frac{600}{50} - 1} = 3{,}32$$

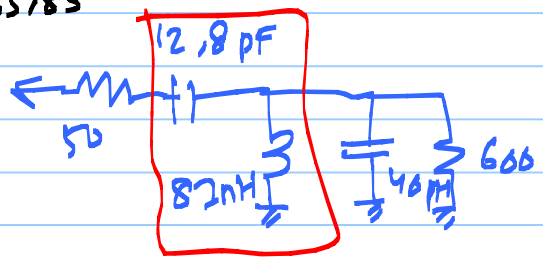
$$Q_s = \frac{X_s}{R_s} \rightarrow X_s = 50 \times 3{,}32 = 165{,}83$$

$$\frac{1}{2\pi f_r C} = 165{,}83 \rightarrow C = \frac{1}{2\pi . 75.10^6 . 165{,}83} = 12{,}8\,pF$$

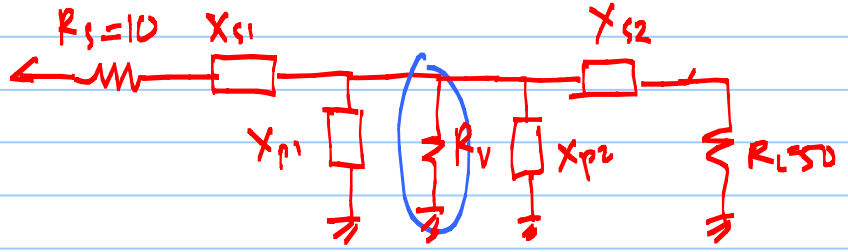
$$Q_p = \frac{R_p}{X_p} \rightarrow X_p = \frac{600}{3{,}32} = 180{,}72$$

$$L = \frac{180{,}72}{2\pi . 75.10^6} = 383{,}5\,nH$$

$$L_t = \frac{L_1 \times L_2}{L_1 + L_2} = \frac{112{,}6\,nH \cdot 383{,}5\,nH}{112{,}6\,nH + 383{,}5\,nH} = 87\,nH$$



- Rancanglah 4 kemungkinan konfigurasi IMC bentuk "T" untuk menyepadankan R_S=10Ω dan R_L=50Ω dengan Q=10.



$$Q = \sqrt{\frac{R_V}{R_{kecil}} - 1}$$

$$R_V = R_{kecil}(1+Q^2) = 10(1+10^2) = 1010\,\Omega$$

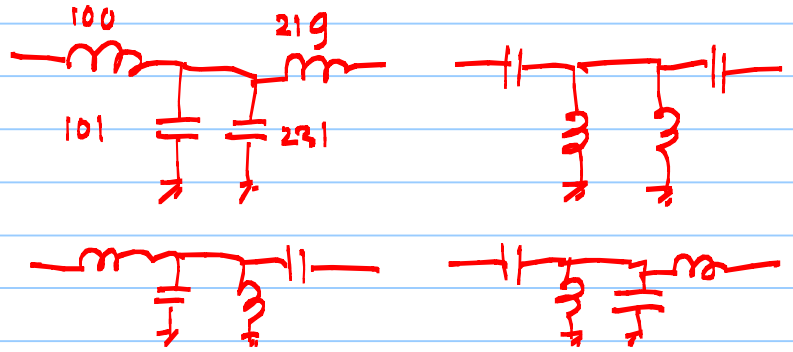
$$Q_S = \frac{X_{S1}}{R_S} \Rightarrow X_{S1} = Q_S \times R_S = 10 \times 10 = 100\,\Omega$$

$$Q_P = \frac{R_V}{X_{P1}} \Rightarrow X_{P1} = \frac{R_V}{Q_P} = \frac{1010}{10} = 101\,\Omega$$

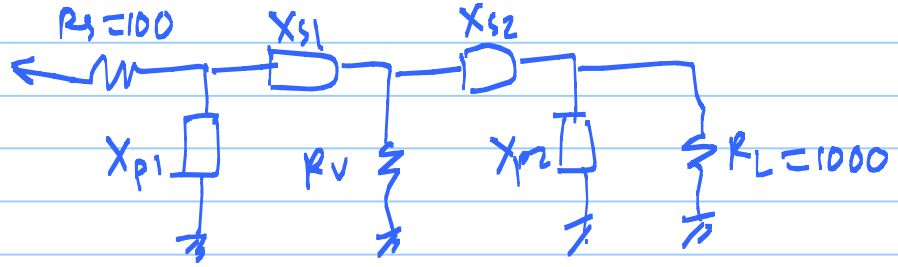
$$Q = \sqrt{\frac{R_V}{R_L} - 1} = \sqrt{\frac{1010}{50} - 1} = 4{,}38$$

$$Q_P = \frac{R_P}{X_{P2}} \rightarrow X_{P2} = \frac{R_V}{Q_P} = \frac{1010}{4{,}38} = 231\,\Omega$$

$$Q_S = \frac{X_{S2}}{R_L} \rightarrow X_{S2} = Q_S \times R_{S2} = 4{,}38 \times 50 = 219\,\Omega$$



- Rancanglah 4 kemungkinan konfigurasi IMC bentuk "π" yang menyepadankan R_S=100Ω, R_L=1000Ω, dengan faktor kualitas Q = 15.



$$Q = \sqrt{\frac{R_{besar}}{R_V} - 1} \Rightarrow R_V = \frac{R_{besar}}{1+Q^2} = \frac{1000}{1+15^2}$$

$$R_V = 4{,}42$$

$$Q = \sqrt{\frac{R_S}{R_V} - 1} = \sqrt{\frac{100}{4{,}42} - 1} = 4{,}65$$

$$Q_p = \frac{R_p}{X_{p2}} \Rightarrow X_{p2} = \frac{R_L}{Q_p} = \frac{1000}{15} = 66{,}67\ \Omega$$

$$Q_s = \frac{X_{s2}}{R_V} \Rightarrow X_{s2} = Q_s \times R_V = 15 \times 4{,}42 = 66{,}3\ \Omega$$

$$Q_s = \frac{X_{s1}}{R_V} \Rightarrow X_{s1} = Q_s \times R_V = 4{,}65 \times 4{,}42 = 20{,}55\ \Omega$$

$$Q_p = \frac{R_p}{X_{p1}} \Rightarrow X_{p1} = \frac{R_S}{Q_p} = \frac{100}{4{,}65} = 21{,}5\ \Omega$$