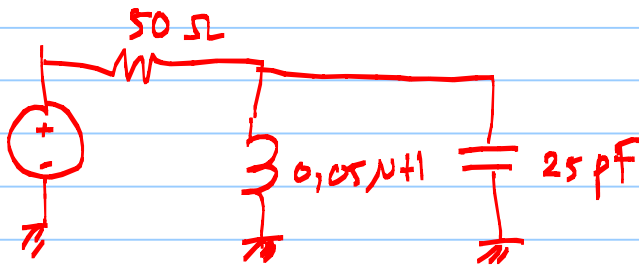


1. Suatu generator dengan $R_s = 50 \Omega$, C dan L tanpa rugi-rugi. $C = 25 \text{ pF}$ dan $L = 0,05 \mu\text{H}$, $R_L = \text{open circuit}$. Tentukanlah nilai :
- $f_c = \dots?$
 - $Q = \dots?$
 - BW 3dB?



$$a. f_c = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{0,05 \cdot 10^{-6} \cdot 25 \cdot 10^{-12}}} = \frac{1}{2\pi\sqrt{1,25 \cdot 10^{-18}}} = 142,35 \text{ MHz}$$

$$b. Q = \frac{R_p}{X_p} = \frac{R_s}{2\pi f_c L} = \frac{50}{2\pi \cdot 142,35 \cdot 10^6 \cdot 0,05 \cdot 10^{-6}} = \frac{50}{2\pi \cdot 7,1175} = 1,12$$

$$c. BW_{3dB} = \frac{f_c}{Q} = \frac{142,35 \text{ MHz}}{1,12} = 127,1 \text{ MHz}$$

2. a. jika soal no.1 diatas nilai $R_s = 1000 \Omega$ hitung nilai Q

b. Jika soal 2.a diatas diberi nilai $R_L = 1000 \Omega$ hitung nilai Q

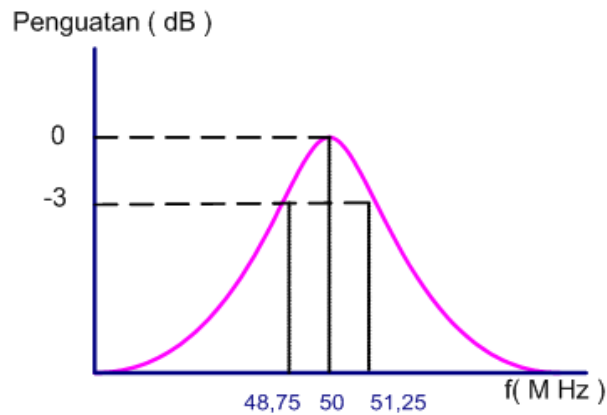
$$a. Q = \frac{R_p}{X_p} = \frac{R_s}{2\pi f_c L} = \frac{1000}{2\pi \cdot 142,35 \cdot 10^6 \cdot 0,05 \cdot 10^{-6}} = \frac{1000}{2\pi \cdot 7,1175} = 22,36$$

$$b. Q = \frac{R_s // R_L}{2\pi f_c L} = \frac{1000 // 1000}{2\pi \cdot 7,1175} = \frac{500}{2\pi \cdot 7,1175} = 11,18$$

3. Rancanglah suatu rangkaian resonator yang mempunyai spesifikasi sbb :

$R_s = 150 \Omega$; $R_L = 1 \text{ k} \Omega$; C dan L ideal

Respon sbb :



$$Q = \frac{f_c}{BW_{3dB}} = \frac{50 \text{ MHz}}{(51,25 - 48,75) \text{ MHz}} = \frac{50}{2,5} = 2,5$$

$$Q = \frac{R_p}{X_p} = \frac{R_s // R_L}{2\pi f_c L}$$

$$L = \frac{R_s // R_L}{2\pi f_c Q} = \frac{150 // 1000}{2\pi \cdot 50 \cdot 10^6 \cdot 2,5} = \frac{130,43}{785,39 \cdot 10^6} = 66,1 \text{ nH}$$

$$Q = \frac{R_p}{X_p} = (R_s // R_L) 2\pi f_c C \Rightarrow C = \frac{Q}{(R_s // R_L) 2\pi f_c} = \frac{2,5}{130,43 \cdot 2\pi \cdot 50 \cdot 10^6} = 61 \text{ pF}$$

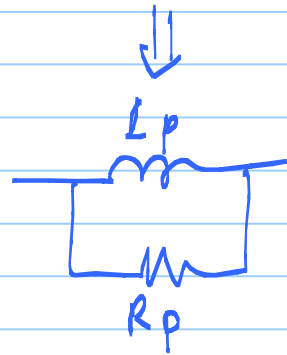
1. Suatu inductor 50 nH dengan hambatan rugi-rugi yang disusun secara seri sebesar 10 Ω . Pada $f = 100$ MHz. Carilah besarnya L dan R baru jika ditransformasikan ke rangkaian ekuivalen Paralelnya !!



$$f = 100 \text{ MHz}$$

$$\rightarrow Q_s = \frac{X_s}{R_s} = \frac{2\pi f L_s}{R_s} = \frac{2\pi \cdot 100 \cdot 10^6 \cdot 50 \cdot 10^{-9}}{10}$$

$$Q_s = 3,14$$



$$Q_p = Q_s = 3,14$$

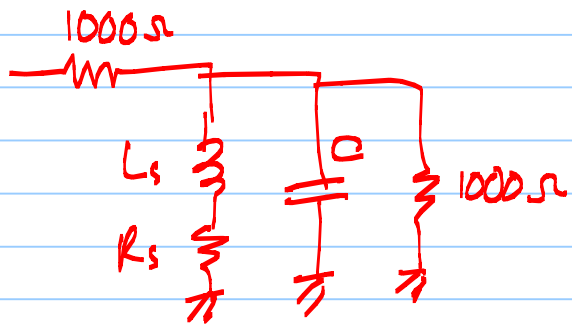
$$R_p = R_s (Q^2 + 1) = 10 (3,14^2 + 1) = 108,596 \Omega$$

$$Q_p = \frac{R_p}{X_p} \rightarrow X_p = \frac{R_p}{Q_p}$$

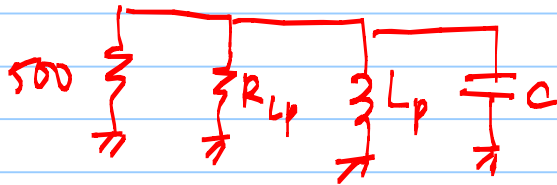
$$2\pi f L_p = \frac{R_p}{Q_p}$$

$$L_p = \frac{R_p}{Q_p \cdot 2\pi f} = \frac{108,596}{3,14 \cdot 2\pi \cdot 100 \cdot 10^6} = 55 \text{ nH}$$

1. Rancanglah rangkaian resonansi sederhana supaya menghasilkan $BW_{3dB} = 10$ MHz pada frekuensi tengah 100 MHz!! Komponen yang dipakai sebagai berikut :
- Hambatan sumber dan beban masing-masing 1000 Kapasitor yang digunakan Ideal (Lossless C)
 - Sedangkan Induktor mempunyai factor $Q = 85$



$$Q = \frac{f_c}{BW_{3dB}} = \frac{100 \text{ M}}{10 \text{ M}} = 10$$



$$Q_p = \frac{R_p}{X_p} \Rightarrow R_p = Q X_p = 85 X_p \Rightarrow R_{Lp} = 85 X_p$$

$$Q = \frac{500 \parallel R_{Lp}}{X_p} = \frac{500 R_{Lp}}{500 + R_{Lp}} = 10 X_p = 10 \cdot \frac{R_{Lp}}{85}$$

$$4250 = 500 + R_{Lp}$$

$$R_{Lp} = 3750 \Omega$$

$$R_{\text{up}} = 85 X_{\text{up}} \Rightarrow L_{\text{p}} = \frac{R_{\text{up}}}{85 \cdot 2\pi f} = \frac{3750}{85 \cdot 2\pi \cdot 100 \cdot 10^4} = 70.2 \text{ nH}$$

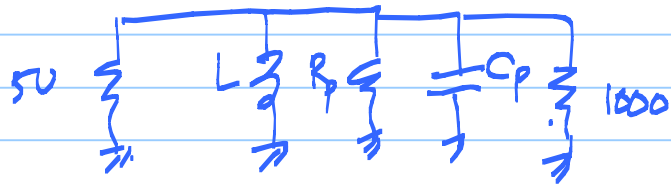
$$Q = (500 // 3750) 2\pi f_c C$$

$$Q = \frac{10}{(500 // 3750) 2\pi \cdot 100 \cdot 10^4} = 36.1 \text{ pF}$$

Rancanglah sebuah resonator dgn $Q = 20$ pada $f = 200 \text{ MHz}$ dgn $R_s = 50 \Omega$ dan $R_L = 1000 \Omega$ dgn L lossless dan Kapasitor mempunyai Q sebesar 60. Tentukan nilai kapasitor awal berikut dgn nilai resistansi serinya.

Jawab :

$$R_{pt} = 50 // 1000 // R_p = 47,6 // R_p$$



$$Q_p = \frac{R_p}{X_p} \rightarrow X_c = \frac{R_p}{60}$$

$$Q_{pt} = \frac{R_{pt}}{X_c} \rightarrow X_c = \frac{R_{pt}}{20} = \frac{47,6 // R_p}{20} = \frac{R_p}{603} \Rightarrow \frac{47,6 \times R_p}{47,6 + R_p} = \frac{R_p}{3}$$

$$R_p = (3 \times 47,6) - 47,6 = 95,2 \Omega$$

$$X_c = \frac{R_p}{60} = \frac{95,2}{60} \Rightarrow C = \frac{1}{1,58 \cdot 2\pi \cdot 200 \cdot 10^6} = 503,7 \text{ pF}$$

$$Q_R = \frac{R_{pt}}{X_L} \Rightarrow X_L = \frac{47,6 // 95,2}{20} = 31,7 \Rightarrow L = \frac{31,7}{2\pi f} = 25,25 \text{ nH}$$

$$R_p = 95,2 \Omega \Rightarrow R_p = R_s (Q_s^2 + 1)$$

$$R_s = \frac{95,2}{60^2 + 1} = 0,026 \Omega$$

$$Q_s = \frac{R_s}{X_s} \rightarrow X_s = \frac{R_s}{Q_s} = \frac{0,026}{60} = 4,41 \cdot 10^{-4}$$

$$C = \frac{1}{4,41 \cdot 10^{-4} \cdot 2\pi f} = 1,8 \mu F$$