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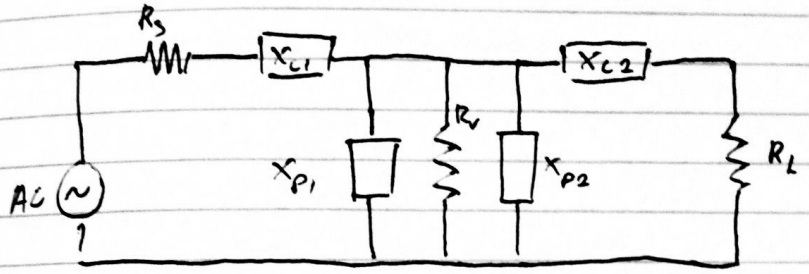
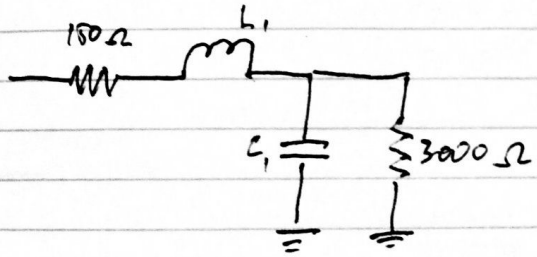
2. $f = 1\ GHz = 10^9\ Hz$
$R_s = 150\ \Omega$
$R_L = 1000\ \Omega$
$R_V = 3000\ \Omega$
Sifat = LPF

a.



#L kiri



$$Q_{kiri} = \sqrt{\frac{R_V}{R_s} - 1} = \sqrt{\frac{3000}{150} - 1} = \sqrt{19}$$

$$Q_c = \frac{X_{C1}}{R_s} \longrightarrow X_{C1} = Q_{kiri} \cdot R_s$$

$$2\pi f L_1 = \sqrt{19} \cdot 150$$

$$L_1 = \frac{\sqrt{19} \cdot 150}{2 \cdot 3{,}14 \times 10^9} = 1{,}04 \times 10^{-7}\ H$$

$$= 104\ nH$$

$$Q_p = \frac{R_p}{X_{P1}} \longrightarrow X_{P1} = \frac{R_V}{Q_{kiri}}$$

$$\frac{1}{2\pi f \cdot C_1} = \frac{3000}{\sqrt{19}}$$

$$C_1 = \frac{\sqrt{19}}{2 \cdot 3{,}14 \cdot 10^9 \cdot 3000} = 0{,}231\ pF$$

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L kanan

$$Q_{kanan} = \sqrt{\frac{R_V}{R_L} - 1} = \sqrt{\frac{3000}{1000} - 1} = \sqrt{2}$$

$$Q_L = \frac{X_{L2}}{R_L} \rightarrow X_{L2} = Q_{kanan} \cdot R_L$$

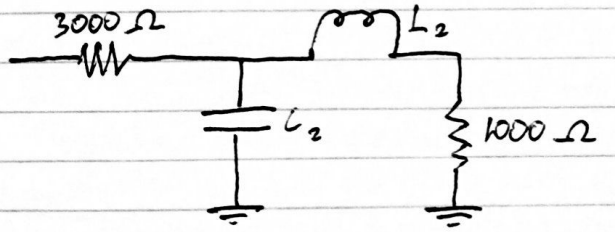
$$2\pi f L_2 = \sqrt{2} \cdot 1000$$

$$L_2 = \frac{\sqrt{2} \cdot 1000}{2 \cdot 3{,}14 \cdot 10^9} = 225 \text{ nH}$$

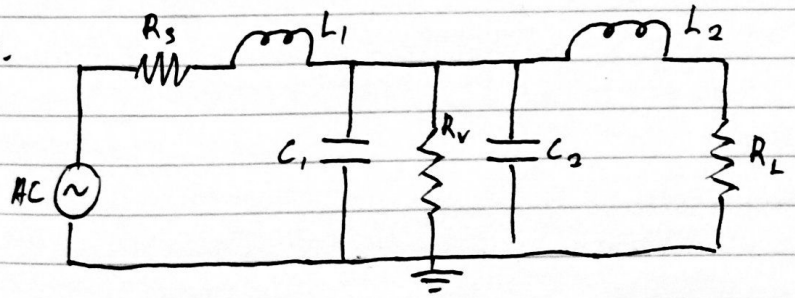
$$Q_p = \frac{R_p}{X_{p2}} \rightarrow X_{p2} = \frac{R_V}{Q_{kanan}}$$

$$\frac{1}{2\pi f C_2} = \frac{3000}{\sqrt{2}}$$

$$C_2 = \frac{\sqrt{2}}{2 \cdot 3{,}14 \cdot 10^9 \cdot 3000} = 0{,}075 \text{ pF}$$



b.



$$Q = \sqrt{\frac{R_V}{R_{kecil}} - 1} = \sqrt{\frac{R_V}{R_s} - 1} = \sqrt{\frac{3000}{150} - 1} = \sqrt{19}$$

$$C_{Total} = C_1 + C_2 = 0{,}231 \text{ pF} + 0{,}075 \text{ pF} = 0{,}306 \text{ pF}$$

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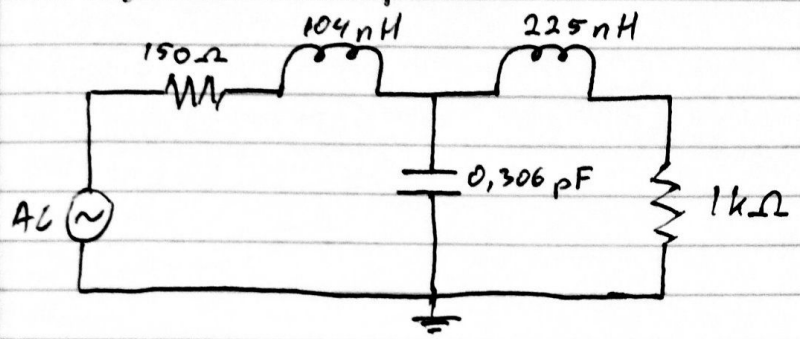
Rangkaian IMC tipe "T"



$$BW = \frac{f}{Q} = \frac{10^9}{\sqrt{19}} = 229.415.733,9 \text{ Hz}$$

$$= 229 \text{ MHz}$$