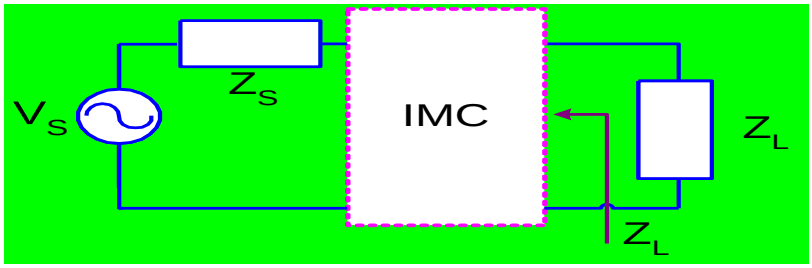
JAWABAN SOAL NO.2

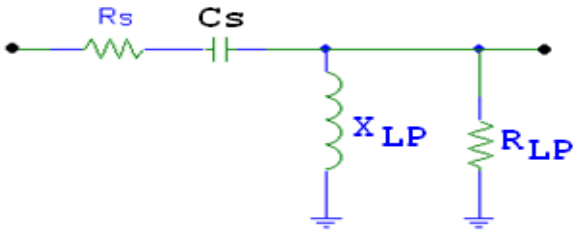
f=2MHz; Zs=(10 – j10)Ω dan ZL=(20 + j200)Ω →Zs<ZL→L-kanan HPF



Untuk mampermudah perhitungan selanjutnya, maka beban Z_L dirubah ke model parallel:

$$Q_S = Q_P = \sqrt{\frac{R_P}{R_S} - 1} \qquad Q_S = \frac{X_S}{R_S} = \frac{200}{20} = 10 \qquad Q_P = \frac{R_P}{X_P} = 10$$

$$R_{Lp} = R_s(1+Q^2) = 2020\Omega; \qquad X_{Lp} = X_s\left(1+1/Q^2\right) = 202\Omega$$

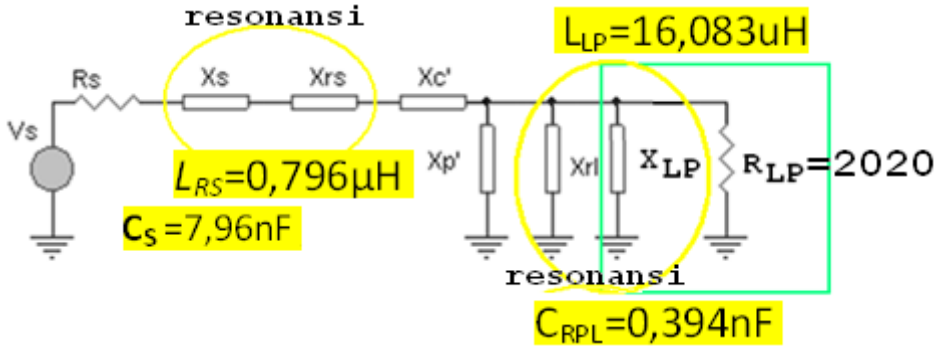


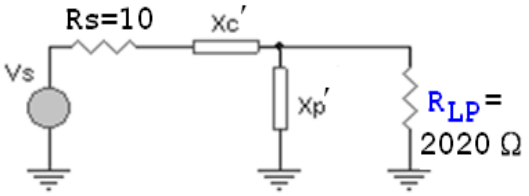
a)Metoda Resonansi :

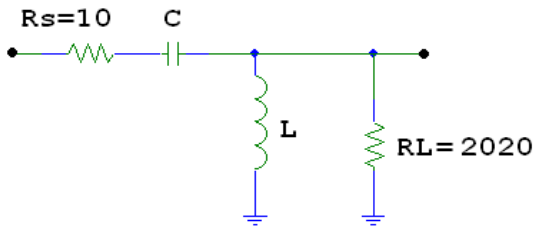
$X_{rs}=X_s$= -10; dan $1/X_{RL}=-1/X_{LP}$= -1/202; X_{RPL}=-202 Ω

C_S =7,96nF **(-j10Ω)** ; L_{RS}=0,796µH **(+j10Ω);**

L_{LP}=16,083uH**(+j202Ω);** C_{RPL}=0,394nF **(-j202Ω);**







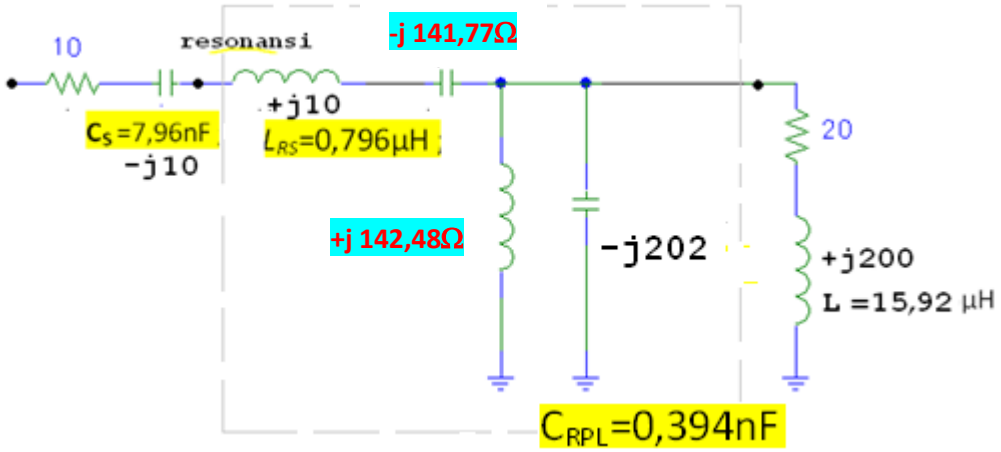
$$Q_S = Q_P = \sqrt{\frac{R_P}{R_S} - 1} = \sqrt{\frac{2020}{10} - 1} = 14{,}177$$

$Q_S = \frac{X_S}{R_S}$ sehingga $X_S = Q_S \times R_S = 14{,}177 \times 10 = 141{,}77\Omega$

Karena bersifat HPF, X_S berupa C sehingga X_S = -j 141,77Ω

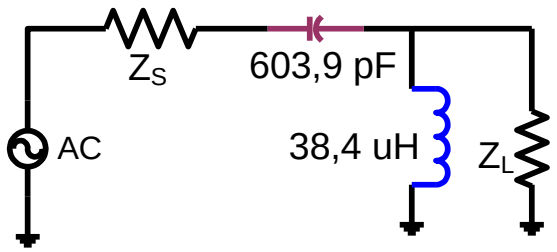
$Q_P = \frac{R_P}{X_P}$ sehingga $X_P = \frac{R_P}{Q_P} = \frac{2020}{14{,}177} = 142{,}48\Omega$

Karena bersifat HPF, X_P berupa L sehingga X_P = +j 142,48Ω

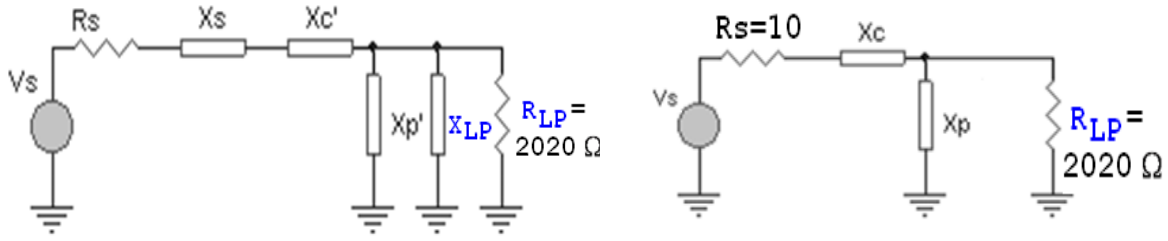


Komponen akhir pada rangkaian adalah sbb:

- **X_S akhir = +j 10 Ω seri dengan –j141,77 Ω = -j 131,77Ω berupa kapasitor C = 603,9 pF**
- **X_S akhir = - j 202 Ω paralel dengan +j142,48 Ω = $\frac{(j142{,}48)\,x(-j202)}{(j142{,}48)+(-j202)}$ = +j 483,55Ω berupa Induktor L = 38,4 µH**



b)Metoda Absorbsi :



$$Q_S = Q_P = \sqrt{\frac{R_P}{R_S} - 1} = \sqrt{\frac{2020}{10} - 1} = 14{,}177$$

$Q_S = \frac{X_S}{R_S}$ sehingga $X_S = Q_S \times R_S = 14{,}177 \times 10 = 141{,}77\Omega$

Karena bersifat HPF, X_S berupa C sehingga $X_S = -j\ 141{,}77\Omega$

$X_S = -j\ 141{,}77\Omega = -j\ 10 + \mathbf{X_{solusi}} \rightarrow \mathbf{X_{solusi}} = -j\ 131{,}77\Omega \rightarrow \mathbf{C = 603{,}9pF}$

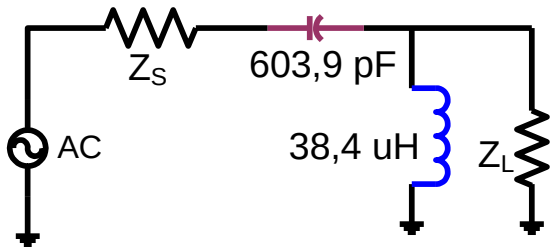
$$Q_P = \frac{R_P}{X_P} \quad \text{sehingga} \quad X_P = \frac{R_P}{Q_P} = \frac{2020}{14{,}177} = 142{,}48\,\Omega$$

Karena bersifat HPF, X_P berupa L sehingga $X_P = +j\ 142{,}48\Omega$

$X_P = +j\ 142{,}48\Omega = +j202\ //\ \mathbf{X_{solusi}}$

$$\frac{1}{X_P} = \frac{1}{j142{,}48} = \frac{1}{+j202} + \frac{1}{X_{solusi}} \Rightarrow \frac{1}{X_{solusi}} = \frac{1}{j142{,}48} - \frac{1}{+j202}$$

$$\Rightarrow \frac{1}{X_{solusi}} = \frac{1}{j142{,}48} + \frac{1}{-j202} = j142{,}48 \,\text{paralel}\, -j202 = +j\,483{,}55$$

$$\Rightarrow L = 38{,}4\,\mu H$$

Rangkaian menjadi :