(1) A parallel resonant circuit has $R = 100K\Omega$, $L = 20mH$, and $C = 5nF$. Calculate $\omega_0, \omega_1, \omega_2, Q$ and B.

Solution

$R = 100K\Omega$

$L = 20mH$

$C = 5nF = 5 \times 10^{-9} F$

$$\omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{20 \times 10^{-3} \times 5 \times 10^{-9}}} = \frac{1}{\sqrt{1 \times 10^{-10}}} = 100,000$$

* $\omega_0 = 100K rads$

$$\omega_1 = \omega_0 - \frac{B}{2}, \quad \omega_2 = \omega_0 + \frac{B}{2}$$

find Q and B

$$Q = \frac{R}{\omega_0 L} = \frac{100 \times 10^3}{100 \times 10^3 \times 20 \times 10^{-3}} = \frac{100}{2} = 50$$

* $Q = 50$

$$B = \frac{\omega_0}{Q} = \frac{100 \times 1000}{50} = 2000 rads$$

$B = 2K rads$

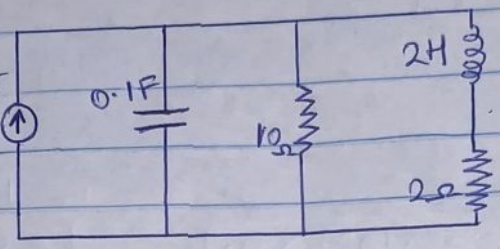
$$\omega_1 = \omega_0 - \frac{B}{2} = 100,000 - \frac{2000}{2} = 99000$$

* $\omega_1 = 99K rads$

$$\omega_2 = \omega_0 + \frac{B}{2} = 100{,}000 + \frac{\overset{1000}{\cancel{2000}}}{\cancel{2}} = 100{,}000$$

$\omega_2 = 100\text{K rads}$

(2) Determine the Resonant frequency of the circuit below



Resonant Frequency, $\omega_0 = ?$

Solution

$C = 0.1F$

$L = 2H$

$R_1 = 10\Omega$, $R_2 = 2\Omega$ Connected in parallel

$R_T = ?$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{10} + \frac{1}{2}$$

$$\frac{1}{R_T} = \frac{1+5}{10} = \frac{6}{10} = \frac{3}{5}$$

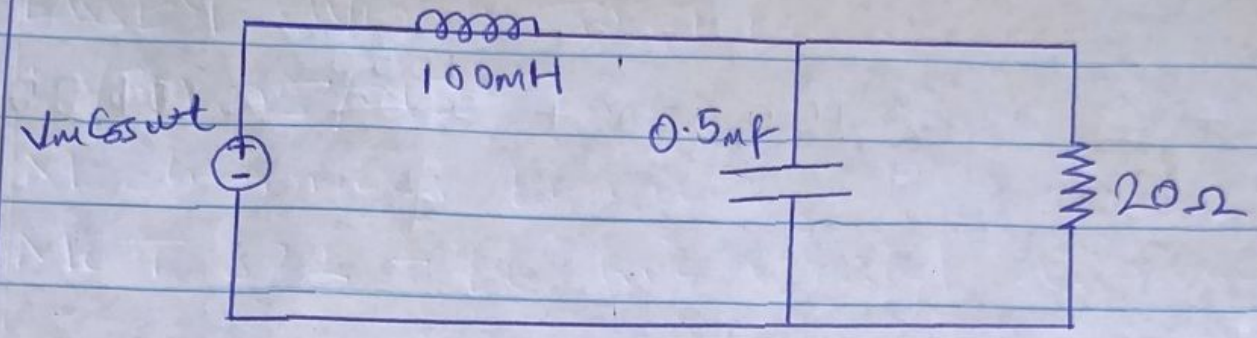
$$R_T = \frac{5}{3} = 1.67\Omega$$

$$\omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{2 \times 0.1}} = \frac{1}{0.447213595}$$

$\omega_0 = \sqrt{5} = 2.236067977$

$\omega_0 \approx 2.24\text{ rads}$

(3) Calculate the resonant frequency of the circuit below:



Solution

$C = 0.5mf = 0.005f$

$L = 100mH = 0.1H$

$R = 20\Omega$

$$\omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{0.5 \times 10^{-3} \times 0.1}} = \frac{1}{\sqrt{5 \times 10^{-5}}}$$

$\omega_0 = 141.42135562 rads$

$\omega_0 \approx 141.42 rads$