Circuit theory assignment [redacted] 56

① $R = 100K\Omega = 100\times10^{3}$

$L = 20mH = 20\times10^{-3}H$

$C = 5\mu F = 5\times10^{-9}F$.

$\omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{20\times10^{3}\times5\times10^{-9}}} = 100000$

$= 100Krad/s$.

$Q = \frac{R}{\omega_0 L} = \frac{100\times10^{3}}{100\times10^{3}\times20\times10^{-3}}$

$= 50$.

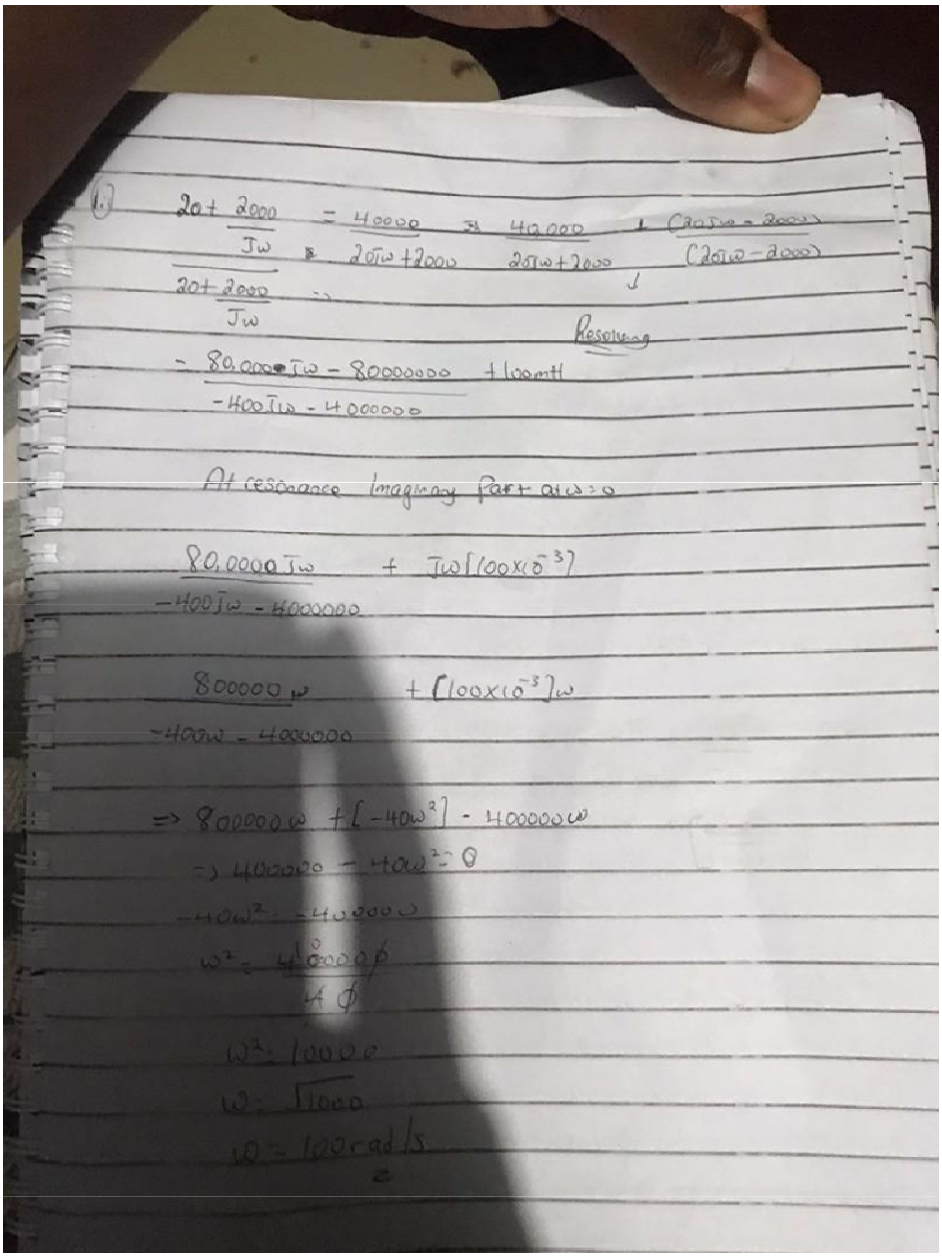
$B = \frac{\omega_0}{Q} = \frac{100\times10^{3}}{50} = 2Krad/s$

$\omega_1 = \omega_0 - \frac{B}{2} = 100\times10^{3} - \frac{2\times10^{3}}{2}$

$= 99Krad/s$.

$\omega_2 = \omega_0 + B/2 = 100\times10^{3} + \frac{2\times10^{3}}{2}$

$= 101Krad/s$



6. $\frac{20 + \frac{2000}{j\omega}}{} = \frac{40000}{} \times \frac{40,000}{20j\omega + 2000} \times \frac{(20j\omega - 2000)}{(20j\omega - 2000)}$

$\frac{20 + \frac{2000}{j\omega}}{} \Rightarrow$

Resolving

$\frac{-80,000 j\omega - 80000000}{-400 j\omega - 4000000} + 100\text{mH}$

At resonance Imaginary part = 0

$\frac{80,0000 j\omega}{-400 j\omega - 4000000} + j\omega[100 \times 10^{-3}]$

$\frac{800000\omega}{-400\omega - 4000000} + [100 \times 10^{-3}]\omega$

$\Rightarrow 800000\omega + [-40\omega^2] - 400000\omega$

$\Rightarrow 400000 - 40\omega^2 = 0$

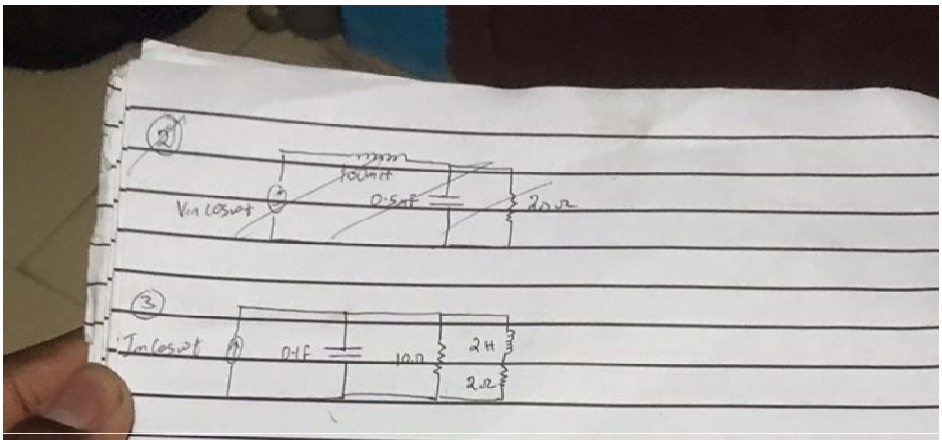
$-40\omega^2 = -400000$

$\omega^2 = \frac{400000}{40}$

$\omega^2 = 10000$

$\omega = \sqrt{10000}$

$\omega = 100 \text{ rad/s}$



The Input admittance is

$$Y = j\omega 0.1 + \frac{1}{10} + \frac{1}{2+j\omega 2}$$

$$= 0.1 + j\omega 0.1 + \frac{2 - j\omega 2}{4 + 4\omega^2}$$

At resonance,

$$\text{Im}(Y) = 0$$

$$\omega_0 0.1 = \frac{2\omega_0}{4+4\omega_0^2} = 0$$

$$\omega_0 = 2 \text{ rad/s}$$