

1) $R = 100k\Omega$

$L = 20 \times 10^{-3} H$

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

$\omega_0 = 1 = \frac{1}{\sqrt{LC}} = 100krad/s$

$\sqrt{LC} = \sqrt{20 \times 10^{-3} \times 5 \times 10^{-9}}$

Q: $R = 100 \times 10^3 = 50$

$\omega_0 L = 100 \times 10^3 \times 20 \times 10^{-3} = 2000$

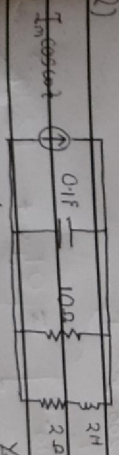
$B = \omega_0 = 2000 \times 10^3 = 2 \times 10^6 rad/s$

$\frac{Q}{B} = 50$

$\omega_1 = \omega_0 - \frac{B}{2} = 100 \times 10^3 - 2 \times 10^3 = 99krad/s$

$\omega_2 = \omega_0 + \frac{B}{2} = 100 \times 10^3 + 2 \times 10^3 = 101krad/s$

2)

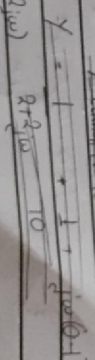


$0.1F \Leftrightarrow 0.1/j\omega \Omega$

$10\Omega \Leftrightarrow 10\Omega$

$2\Omega \Leftrightarrow 2\Omega$

$2H \Leftrightarrow 2j\omega$



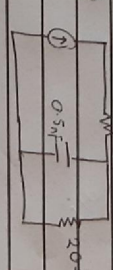
$Y = j\omega 0.1 + \frac{1}{10} + \frac{1}{2 + j\omega 2}$

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

at resonance $\Im(Y) = 0$

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

$\omega_0 = 2rad/s$



$100mH \Leftrightarrow j0.1 \Omega$

$0.5mF \Leftrightarrow 0.5 \times 10^{-3} \frac{1}{j\omega} = \frac{1}{j2000\omega}$

$20\Omega \Leftrightarrow 20\Omega$

$\Rightarrow 0.1 \frac{1}{j\omega} + \left[\frac{20 \cdot \left[\frac{1}{2000j\omega} \right]}{20 + \left[\frac{1}{2000j\omega} \right]} \right] = Z$

$Z = 0.1 \frac{1}{j\omega} + \frac{20 \left[0.5 \times 10^{-3} \right]}{20 + 0.5 \times 10^{-3} \frac{1}{j\omega}} = \left[0.1 \frac{1}{j\omega} + \frac{10 \times 10^{-3}}{20 \frac{1}{j\omega} + 0.5 \times 10^{-3}} \right]$

$$Z = 0.1 \omega + 10 \times 10^{-3} + 20 \omega + 0.5 \times 10^{-3}$$

at resonance $I_m(z) = 0$

$$0.1 \omega + 10 \times 10^{-3} = 0$$

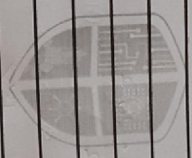
$$20 \omega + 0.5 \times 10^{-3}$$

$$0.1 \omega = (20 \omega + 0.5 \times 10^{-3}) + 10 \times 10^{-3} = 0$$

$$20 \omega^2 + 0.5 \times 10^{-4} \omega + 10 \times 10^{-3} = 0$$

use

$$\omega_0 = 100 \text{ rad/s}$$



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