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Course: Computer Engineering

(i) A parallel resonant circuit has $R = 100k\Omega$, $L = 20mH$ & $C = 5nF$. Calculate ω_o, ω_1, ω_2, Q & B

$\rightarrow \omega_o = 1/\sqrt{LC} = \frac{1}{\sqrt{(20 \times 10^{-3}) \times (5 \times 10^{-9})}}$

$= 100k\ rads^{-1}$

$\Rightarrow B = \omega_o/Q = 1/RC = \frac{1}{100k \times (5 \times 10^{-9})}$

$= 2k\ rads^{-1}$

From above $\omega_o = 100k\ rads^{-1}$ & $B = 2k\ rads^{-1}$

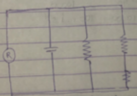
$\therefore Q = \frac{\omega_o}{B} = \frac{100 \times 10^3}{2 \times 10^3} = 50$

Since $Q \geq 10$

$\rightarrow \omega_1 = \omega_o - B/2 = 100 \times 10^3 - 2 \times 10^3/2 = 99\ Krads^{-1}$

$\omega_2 = \omega_o + B/2 = 100 \times 10^3 \times 2 \times 10^3/2 = 101\ Krads^{-1}$

(ii) Determine the resonant frequency of the circuit below



The input admittance is $Y = j\omega 0.1 + \frac{1}{10} + \frac{1}{2 + j\omega}$

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

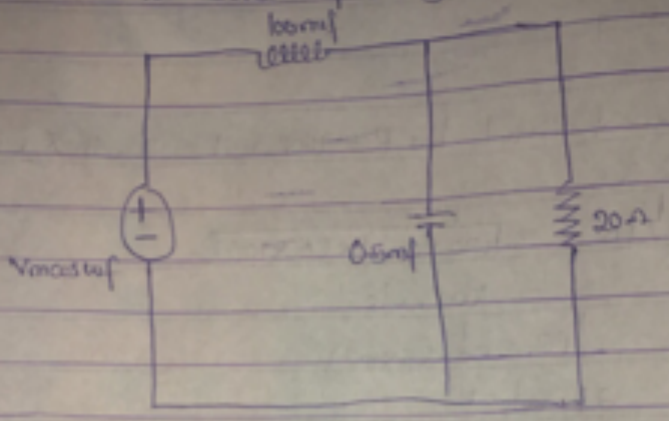
At resonance,

$Im(Y) = 0$

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

$\omega = 2\ rads^{-1}$

(iii) Calculate the resonant frequency of the circuit below



At resonance of the imaginary part at $\omega = 0$

$$\frac{80{,}000}{j\omega} + j\omega(100 \times 10^{-3})$$

$$-400j\omega - 400000$$

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

$$= 400000 + 40\omega^2 = 0$$

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

$$\omega^2 = \frac{-400000}{-40} = 10000$$

$$\omega = \sqrt{10000} = 100 \text{ rad s}^{-1}$$