Assignment

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17/ENG02/070
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1) A parallel resonant Circuit has R = 100 KΩ and L = 20 mH, & C = 5nf. Cal $\omega_0, \omega_1, \omega_2$ & β

Sol

$\omega_0 = 1/\sqrt{LC} = 1/\sqrt{(20\times10^{-3}) \times (5\times10^{-3})}$

$= 100$ krad/s

$\beta = \omega_0/Q = 1/RC = 1/100 \times (5\times10^{-3}) = 2$ krad/s

from the equations above, we know that $\omega_0 = 100$ rad/s and $\beta = 2$ krad/s

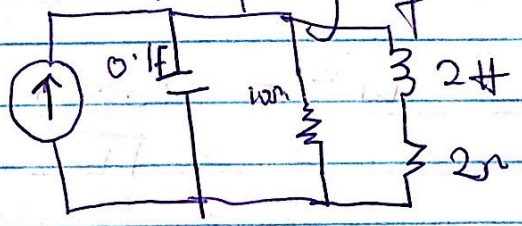
$\therefore Q = \omega_0/\beta = 100\times10^3/2\times10^3 = 50$

Since $Q > 10$

$\omega_1 = \omega_0 - \beta/2 = 100\times10^3 - 2\times10^3/2 = 99$ krad/s

$\omega_2 = \omega_0 + \beta/2 = 100\times10^3 + 2\times10^3/2 = 101$ krad/s

2) Determine the resonant frequency of the circuit



Sol

The input admittance is

$Y = j\omega 0.1 + 1/10 + 1/2 + j\omega 2$

$= 0.1 + j\omega 0.1 + 2j\omega^2/4 + 4\omega^2$

At Resonance

$Im(Y) = 0$

$\omega_0 0.1 = 2\omega_0/4 + \omega_0^2 = 0$

$\omega_0 = 2$ rad/s

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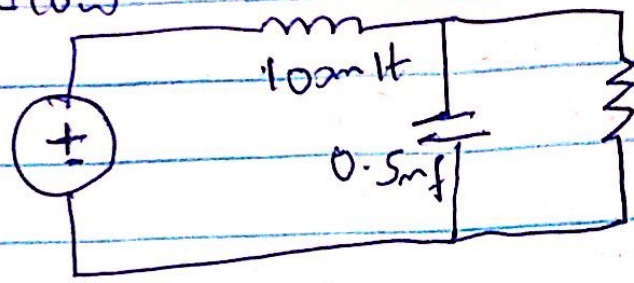
3) Calculate the resonant frequency of the circuit below



Soln

$$\frac{20 + 20/j\omega}{20 + 2000/j\omega} = \frac{400\omega}{20j + 2000} - \frac{40000}{20j\omega + 2000} + \frac{(20j\omega - 2000)}{(20j\omega - 2000)}$$

$$= \frac{8000j\omega - 80000000}{-400\omega^2 - 4000000} + 100mH$$

At the resonate of the imaginary part,

$\omega = 0$

$$8000j\omega + j\omega(400 \times 10^{-3})$$

$$= 8000\omega + (-40\omega^2) - 400\omega$$

$$= 4000\omega - 40\omega^2 = 0$$

$$-40\omega^2 = -40000$$

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

$$\omega^2 = 10000$$

$$\omega = \sqrt{10000}$$

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