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EEE 322

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

$= 100K$ rad/s

$B = \frac{\omega_0}{Q} = 1/RC = \frac{1}{100\times(5\times10^{-3})}$

$= 2K$ rad/s

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

Since $Q \geq 10$

$-\omega_1 = \omega_0 - B/2 = 100\times10^3 - \frac{2\times10^3}{2} = 99$krad/s

$\omega_2 = \omega_0 + B/2 = 100\times10^3 + \frac{2\times10^3}{2} = 101$krad/s

ii) Input admittance:

$Y = jw\,0.1 + 1/10 + 1/2 + jw_2$

$= 0.1 + jw_0.1 + \frac{2 - jw_2}{4+4w^2}$

at Resonance

$Im(Y) = 0$

$w_0\,0.1 = \frac{2w_0}{4+w_0^2} = 0$

$w_0 = 2$ rad/s

3) $\frac{20 + \frac{20w}{jw}}{20 + \frac{20w}{jw}} = \frac{400w}{20jw+20w} - \frac{400w}{20jw+20w}$

$+ \frac{(20jw - 20w)}{(20jw - 20000)}$

$= \frac{800wjw - 800\,00000}{-400jw - 4000000} + 100mH$

At resonance of the imaginary path at $w = 0$

$\frac{80{,}000jw}{-400jw - 4000000} + jw[100\times10^{-3}]$

$= 800000w + [-40w^2] - 400000w$

$= 400000 - 40w^2 = 0$

$-40w^2 = -400000$

$w^2 = 10000$

$w = \sqrt{10000}$

$w = 100$ rad/s