EE 3 F'13 Quiz 2 Solution

a) This is an adder circuit

2 $v_o = -\left(10v_1 + 10v_2\right) = -10\left(v_1 + v_2\right)$

b) This is a series RLC circuit and so

$$v_o = i\left(R + j\omega L + \frac{1}{j\omega C}\right)$$

3

$$i = \frac{v_o}{R + j\left(\omega L - \frac{1}{\omega C}\right)} = \frac{-10\left(v_1 + v_2\right)}{100 + j\left(10^{-3}\omega - 10^9/\omega\right)}$$

c) For the circuit to be purely resistive, the imaginary part must go to zero.

2 Thus $10^{-3}\omega_0 - 10^9/\omega_0 = 0$; $\omega_0^2 = 10^{12}$

$\omega_0 = 10^6$ rad/s.

d) The response due to the sinusoid at ω_0 is proportional to $\frac{1}{100}$

3 The response ~~dot~~ ω_1 is proportional to

$$\frac{1}{\sqrt{100^2 + \left(1.1\times10^3 - 1/1.1\times10^{-3}\right)^2}} = \frac{1}{215}$$

Thus it is down by a factor of $20\log\left(\frac{215}{100}\right)$

or 6.6 dB