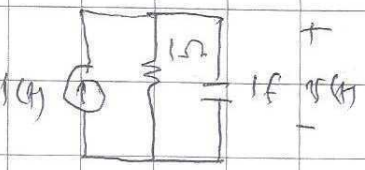
ASSIGNMENT 5

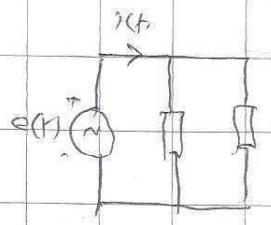
Q1



$i(t) = 1 + 2\cos 2t$

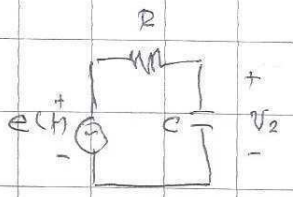
Find steady state $v(t)$

Q2 Given $e(t) = 50\sin(10t + \pi/4)$ $\quad i(t) = 400\cos(10t + \pi/6)$



find suitable elements R or L or C and their values.

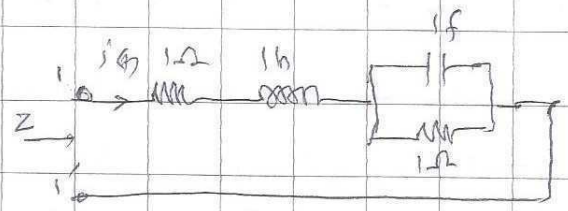
Q3



$e(t) = \cos \omega t$

Find R and C which will make $V_2(t)$ lag 45° behind $e(t)$. What is magnitude of $V_2(t)$ at that frequency.

Q4:

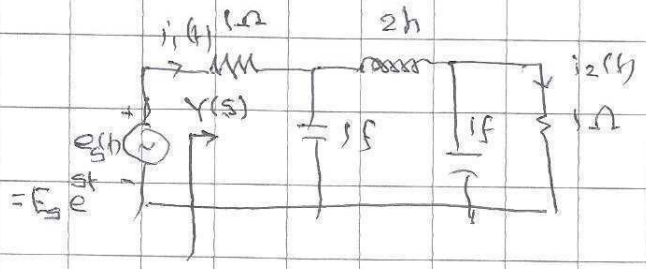


- Determine $Z(j\omega)$. Plot magnitude and phase of $0 < \omega < \infty$
- If $V_s(t) = 10\cos 2t$ is applied between 1 and 1' what is current $i(t)$ into the network
- If a current source $i_s(t) = 1 + \cos t + \cos 2t$ is applied at 1 1' determine steadystate voltage $v(t)$ across 1 1'

Q5. The change of $Z(j\omega) = R(\omega) + jX(\omega)$ as ω varies from 0 to ∞ is plotted on argand diagram with $R(\omega)$ on x axis and $X(\omega)$ on Y-axis (imaginary axis)
(real axis)

For the problem in Q4, what is the locus of impedance i.e (at $\omega = \omega_1$, calculate $R(\omega_1)$ and $X(\omega_1)$ plot the complex number $Z(j\omega_1)$ on argand diagram. change $0 < \omega < \infty$ and draw the locus)

Q6



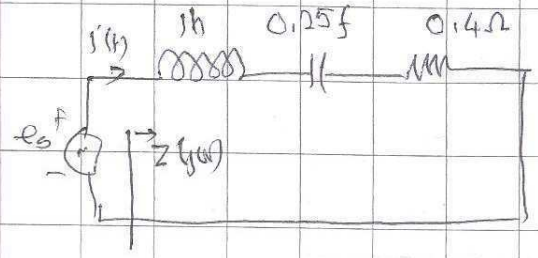
a. Calculate $Y(s)$

b. calculate $\frac{I_2(s)}{E_s} = Y_{21}(s)$

(c) If $e_s(t) = 2\cos 2t$, find $i_1(t)$ and $i_2(t)$

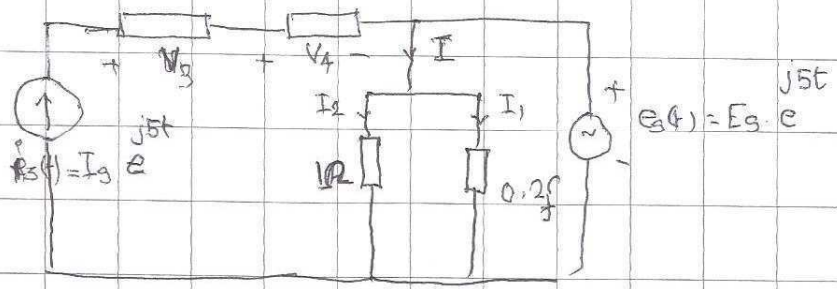
(d) Do you observe any commonality between $Y(s)$ and $Y_{21}(s)$. If so, can you argue why it is so?

Q7



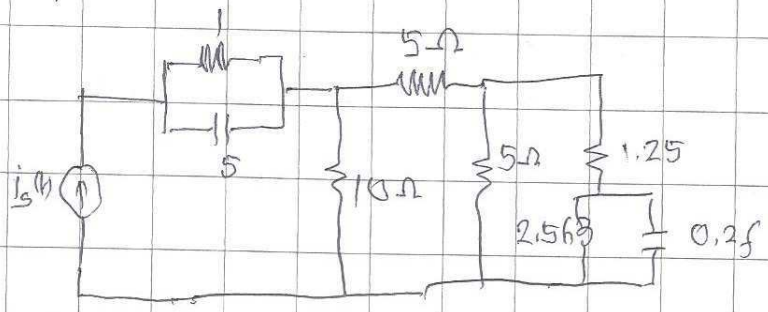
- find i(t) if $e_s = \sin \omega t$ for $\omega = 2, 2.02, 2.04$ rad/sec
- calculate average energy stored in capacitor at above ωs
- calculate average energy stored in inductor at above ωs
- calculate the average power dissipated at above ωs.
- Is there any relation between Z(jw) and the average stored energies and dissipated power at these ωs.

Q8



- It is found $I = I_0 e^{j5t + j\theta}$ with $I_0 = 10\sqrt{2}$ what is E_s and θ
- It is found $V_4 = 1 \angle 0^\circ$ volts $V_5 = 2\sqrt{2} \angle 90^\circ$ for $I_s = 1$ amp. what are the elements corresponding to V_4 and V_5
- Find complex power in all elements and sources and separate real power and reactive power.
- Does average power supplied = average power dissipated
- compute average energy stored in storage elements!

Q9



$i_s(t) = 10 \cos t$.

Find all voltages across and currents through all elements in the network connected at the input terminals P_{av} and Q_{av} and check $\sum_{\text{all elements}} P_{av_i} = P_{av_{input}}$

(You may use Thevenin/Norton for simplifying calculations)