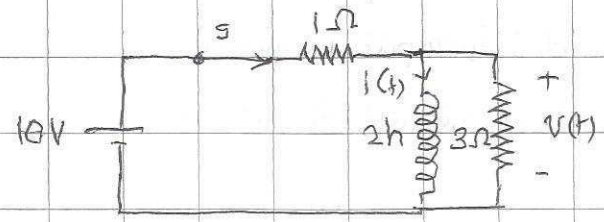
ASSIGNMENT 4

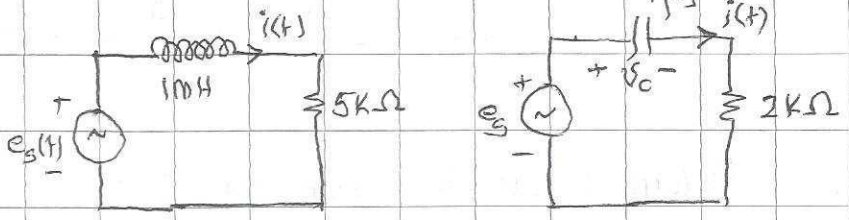
Q1 Switch S is closed until steady state is reached and then opened. Assuming it is opened at $t=0$, find $i(t)$ and $v(t)$ for $t>0$



Q1

Q2: Let $i(0) = 2mA$. The source $e_s(t)$ is made $10\,V_{DC}$ for $t>0$ and current $i_{10}(t)$ is noted. Then $e_s(t)$ is made $30\,V_{DC}$ for $t>0$ and current $i_{30}(t)$ is measured. Is $i_{30}(t) = 3\,i_{10}(t)$. Why?

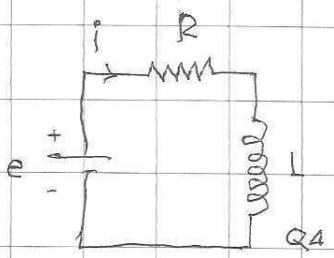
If $i(0) = 0$, and the same experiment is conducted will $i_{30}(t) = 3\,i_{10}(t)$. Why?



Q2

Q3 Let $v_c(0) = 1\,volt$. The source e_s puts out $30\cos(2\pi \times 10^3 t + \phi)$. calculate $i(t)$ for $t \geq 0$. Is there a value of ϕ such that the complete response $i(t)$ does not have any transients?

Q4



$R = 500\,\Omega \quad L = 10\,mH \quad e = 8V$

$i(0) = -10\,ma$

a. calculate $i(t)$ $t \geq 0$ by computing Zero-state response and Zero input response

b. Is there a steady state value of $i(t)$?

Q5 Given a network N containing R, L and C. The Zero-state response $v_1(t)$ to the sinusoidal input $i_1(t) = \cos 2t$ for $t \geq 0$ is given by

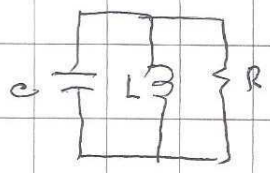
$$v_1(t) = e^{-t} + 2e^{-2t} + \cos(2t + 60^\circ) \quad t \geq 0$$

The complete response for $i_2(t) = 3\cos 2t \quad t \geq 0$ when the circuit starts from certain initial state is:

$$v_2(t) = -e^{-t} + 3e^{-2t} + 3\cos(2t + 60^\circ) \quad t \geq 0$$

Determine complete response for $i_3(t) = 5\cos 2t \quad t \geq 0$ if the circuit starts from same initial state.

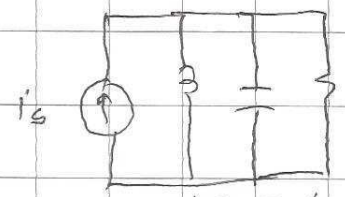
Q.6 :



$\omega_0 = 10$ rad/sec $C = 1f$ $Q = \frac{1}{2}$.

a. Write down the differential equation governing v_c across capacitor and solve for $v_c(t)$ for $t \geq 0$ for zero input response if $v_c(0) = 2$ volts and $i_L(0) = 5$ amp.

b. Now connect a current source $i_s(t) = \cos 2t$ $t \geq 0$ in parallel to the network
Initial conditions are same.
Find the complete response



Same as in (a)

c. Can you seperate zero state response from the complete response?