Assignment : Due date Oct 9th, 6PM.

Late and plagiarized submissions will be penalized

1) For an series RLC circuit, given the KVL expression $L\frac{di(t)}{dt}+R\,i(t)+v_c(t)=V_s$

where V_s is the voltage source that is connected to RLC circuit.

In the above expression substitute $i(t)=C\frac{dv_c(t)}{dt}$ and obtain the second order differential equation in terms of V_c. For the same differential equation derived in terms of Vc

a) Obtain the complete solution.
b) Assuming V_s is disconnected from the circuit, obtain the natural or transient solution for i) Underdamped ii) overdamped and iii) Critically damped
c) Draw the V_c-t curves for each case mentioned in (b).
d) compare the V_c(t)-t curves and i(t)-t curves for the series RLC circuit for each case mentioned in (b) and comment on the nature of the curves
e) comment on the Value of V_c(t) and i(t) at t=0 and t=infinity.

2) A 15µF capacitor is connected in series with a 1.1MΩ resistor. This series combination is connected across a 120V dc supply. Calculate

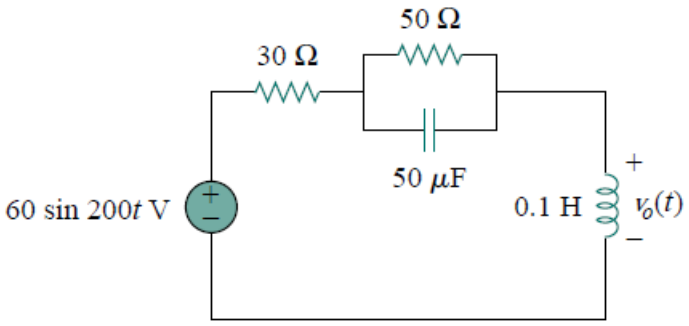
a) The time constant of the circuit
b) The initial value of the charging current
c) The initial rate of rise of voltage across the capacitor
d) The voltage across the capacitor after a time equal to the time constant.
e) The circuit current after a time equal to the time constant
f) The voltage across capacitor at 4 seconds after switch on.
g) the time taken by the capacitor voltage to reach 60V.

3) A 160V source is connected in series to 25µF capacitor and a 90KΩ resistor. Calculate

i) The time constant of the circuit and ii) steady state current

The source is disconnected when the capacitor is fully charged and a 5µF capacitor is connected in parallel with the 25µF capacitor. Assume that there is no loss of charge in the process. The combination is discharged through the (90+10)KΩ resistor. How long from the commencement of discharge will the voltage take to fall to 40V.

4) Find Vo(t) from the circuit



5) If the source frequency is 60Hz. Find $i_1(t)$ and $i_2(t)$.