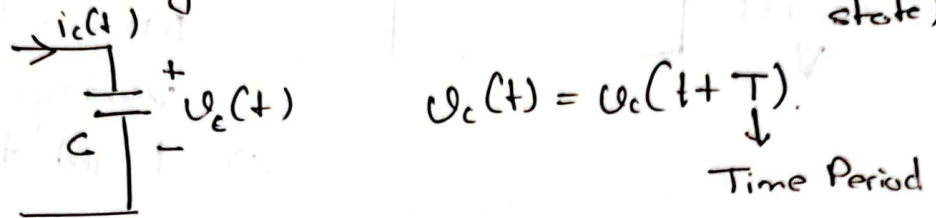
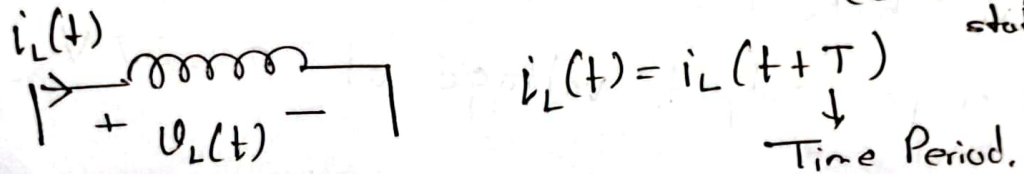


EE 238.
Assignment - I
Practice Problems - I

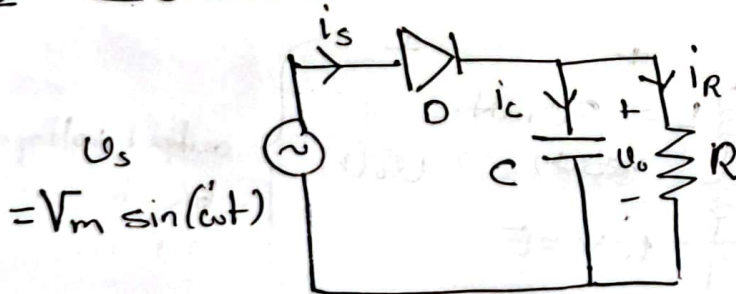
- 1) Prove that the average current in a capacitor for a periodic voltage across it is zero. (at steady state).



- 2) Prove that the average voltage across an inductor for a periodic current through it is zero. (at steady state)



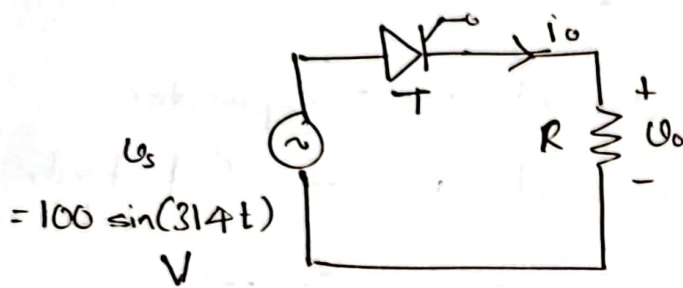
- 3) Consider the circuit below.



The time constant of the RC circuit is such that the output voltage becomes zero just before the diode is forward biased.

- Draw v_o & find the expression of $v_o(t)$ for $0 < t < T$.
 - Draw the waveforms of i_R , i_c & i_s .
 - Comment on the nature of i_s .
- Time period
($T = \frac{2\pi}{\omega}$)

4) Consider a half wave ~~sim~~ semi-controlled rectifier.
The firing angle of the Thyristor is $\alpha = 30^\circ$ (after $\omega t = 0^\circ$)

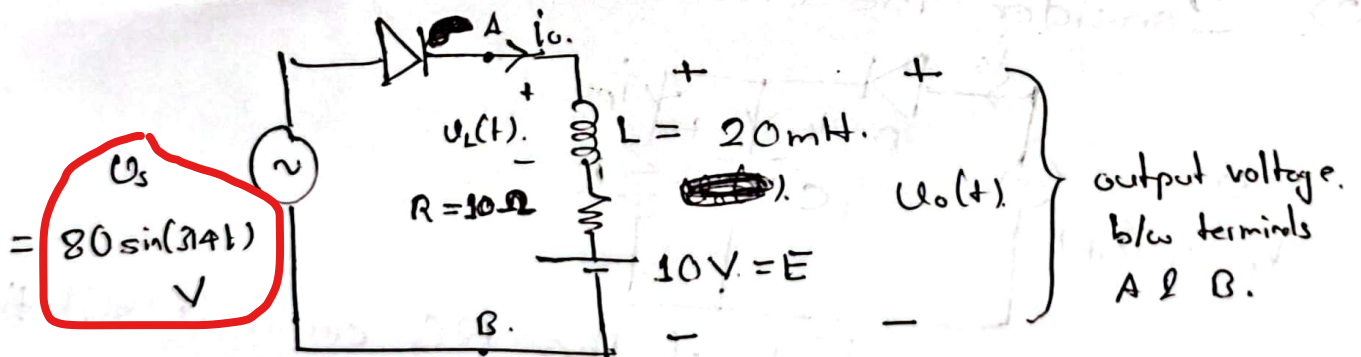


- Draw the waveforms of $u_o(t)$ & $i_o(t)$
- Find the average and RMS value of the output voltage.

c) Find the average output power.

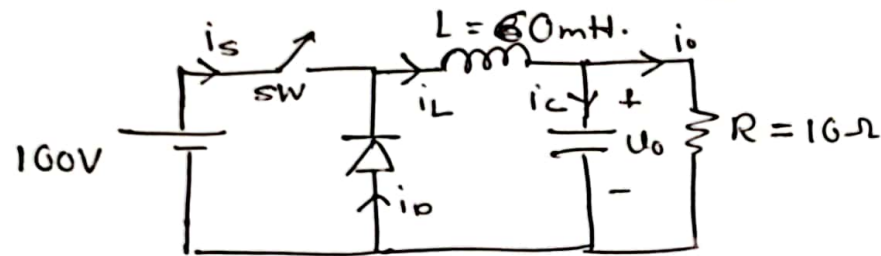
d) Find the time after $t = 0$ s in the first cycle at which the SCR should be triggered to get an average output voltage of 23.87 V.

5) Consider the circuit below.



If the average output voltage is 50 V and the dc source at the output is of 10 V. $R = 10 \Omega$. Find the average output current.

Q) For the buck converter with duty ratio $D = 0.5$ and $f_s = 2 \text{ kHz}$, assume that the capacitor is large such that the output voltage is ripple free.



At steady state.

- 1) Find U_0 and average inductor current (I_L)
- 2) Find the average diode current (I_D) and Average switch current (I_{sw}). [Hint: Use Power balance]
- 3) Find the ripple in inductor current ($\Delta I_L = I_{Lmax} - I_{Lmin}$) and also I_{Lmax} and I_{Lmin} .