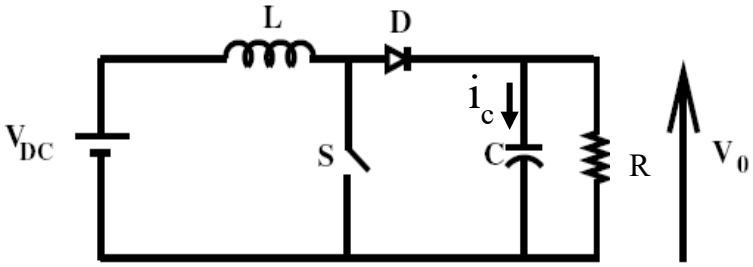
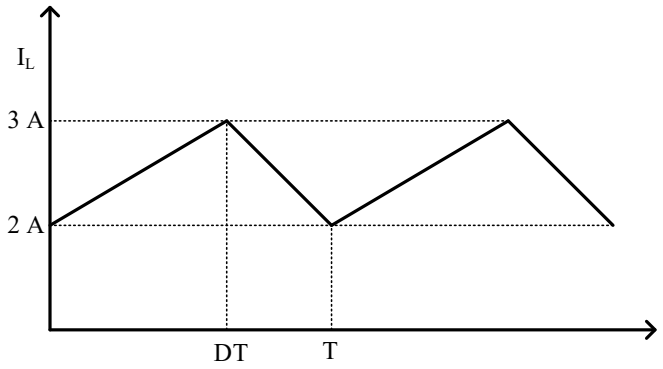
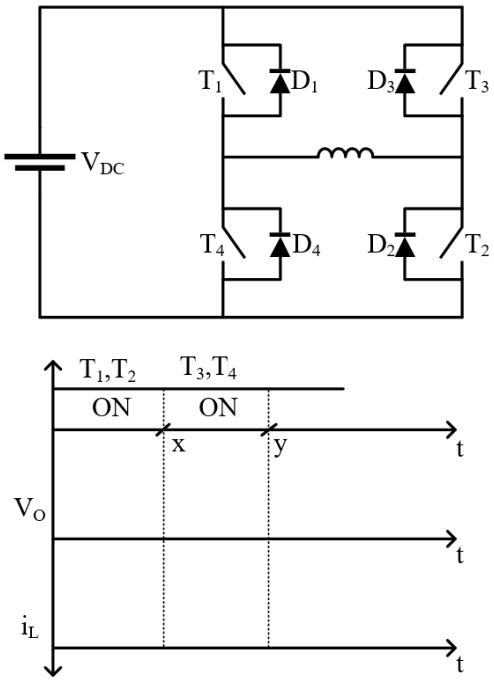
1. For the boost converter shown in figure V_{DC}=30 V V_O=60 V, switching frequency=100 kHz. Assume that V_O is held constant for a-b.





a. Duty Cycle. **(0.5-mark)**
b. Value of L in μH. **(0.5-mark)**
c. Sketch the labelled waveform of current flowing through the capacitor assuming that charging current is +ve. (Credit will be given only if the waveform is correct. No partial credit). **(1-mark)**
d. Sketch the variation of V_O assuming that current through RL remains constant Note that nature of variation may not be important. (No partial credit). **(1-mark)**

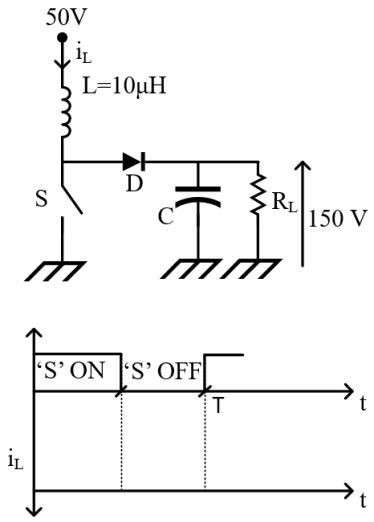
2. A single phase full bridge VSI is feeding a purely inductive load as shown. Where T_1-T_4 are transistors and D_1-D_4 are feedback diodes. Also note that having turned on each pair of devices is maintained in that state for π radians. The frequency of the voltage applied to the load is 50 Hz.



a. Determine x and y in m sec. **(0.5-mark)**
b. Draw the labelled waveform of voltage applied to the load. **(0.5-mark)**
c. Draw the labelled load current waveform, assuming that steady state is achieved and average value of load current is zero. **(1-mark)**
d. Determine the time duration (in m sec) of conduction of transistor T_1 and diode D_1. **(1-mark)**

Check whether the IL is getting 0 before the cycle or not.

3. The boost converter shown in figure operates with a duty cycle of 0.5 and switching frequency=100 kHz. Determine:
    a. The time in μsec for which diode D is conducting. **(1-mark)**
    b. Draw the labelled inductor current waveform. **(1-mark)**



4. Suggest a circuit for buck-boost converter which can transfer power in both the directions, i.e. power can flow from low-voltage side to high-voltage side, as well as from high-voltage side to low-voltage side. **(1-mark)**

5. In one case, a regulated 5-volt supply is obtained using a linear regulator (e.g. LM7805 IC). In other case, a switching regulator is used to obtain regulated 5-volt supply. For both the cases, qualitatively plot the efficiency curve as a function of input voltage. **(1-mark)**