- [ ] Mosfet is controlled by voltage gate-drain

- [ ] In a non controlled rectifier feed the national electric grid i is advisable the use of fast recovery diodes.

- [F] In a ideal power factor correction system, the load current has no harmonics
  "all forms of waves are made up of the sum of harmonics"

- [F] In a fully controlled PD3 rectifier with RLE load, the average value of output voltage can be zero.
  "if E exists the average is likely to be E"

- [ ] In a diode rectifier is possible that the load delivers active power to the source

- [F] In a PD6 rectifier there are 6 semiconductors
  12

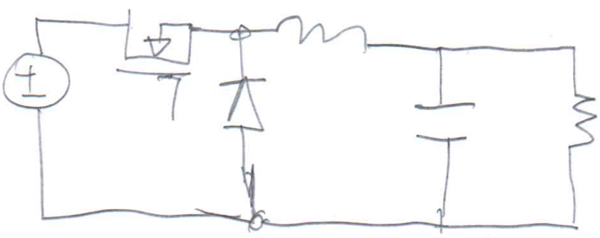
- [V] In a 1 quadrant DC/DC buck converter without LC filter, the conduction regime is discontinuous if the load is purely resistive.

- [ ] In a 4 quadrant DC/DC converter, whatever is the type of load, the load current always changes its direction during an operation period.

- [ ] In an inverter with square wave control the frequency of the output voltage fundamental component is equal to the switching frequency of the inverter.

☐ In a 3-phase inverter with sinusoidal PWM control there are 3 carrier signals.

2) [3,0 val] Identify the converter in the figure by its usual designation. Describe the control strategy for this converter and its relationship to the output voltage. Identify two factors that differentiate an ideal converter from a real converter, and describe the influence of these factors on the converter's output voltage.



3) Consider a PD3 semi-controlled rectifier with an RLE Load ($R = 10\ \Omega$ and $E = 50V$), such that the load current is constant. The 3-phase system is characterized by line to line voltages with the peak value equal to 500 V. The firing angle of the thyristors is $\frac{\pi}{3}$ rad (60°)

a) [0,5 val] Draw the electrical schematic of the power part of this rectifier. Identify all represented semiconductors.

b) [2,5 val] Draw the waveforms of $V_0(t)$, $V_{T1}(t)$, $V_{T1'}(t)$ and phase 2 current $i_{S2}(t)$, respecting the temporal relations between the waveforms.

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3 b) continue.

Represent the conduction intervals of all semiconductors.

c) [1,0 val] Present the integral that allows you to calculate the average value of the output voltage.

d) [1,5 val] Present the expressions (in as much detail as possible) that allows you to calculate the active power and apparent power per phase.

4. Consider the 1 quadrant buck converter in the figure where the conduction regime is continuous although the load current is not constant.

Assume: $V_i = 200$ V, $E = -50$ V, $T = 10$ ms and $D = \frac{3}{4}$

a) [3,0 val] Considering the steady-state regime represent the waveforms of the following voltages, indicating their minimums and maximums:

Output voltage, $v_O(t)$; Mosfet control voltage, $V_{con}(t)$; Mosfet drain-source voltage, $v_{DS}(t)$; Diode anode cathode voltage $v_D(t)$.

Represent also a possible waveform of current;

In the Load, $i_o(t)$;

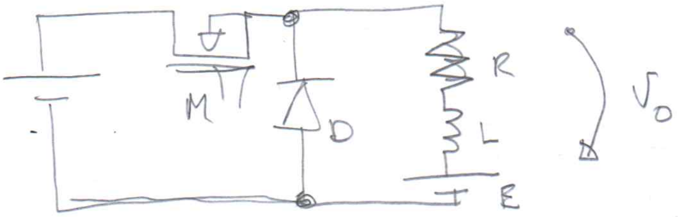
In the Mosfet, $i_M(t)$;

In the Diode, $i_D(t)$;

Represent the conduction intervals of all semiconductors.

b) [0,5 val] Present the integral that allow you to calculate the average value of $V_o(t)$.

c) [0,5 val] considering a 150 V diode say, justifying, if it is an adequate choice for this converter.



5) Figure 1 represent an inverter and the corresponding control circuit implemented in PSIM. Figure 2 represent the signals of a two-level square control (phase-shifted).

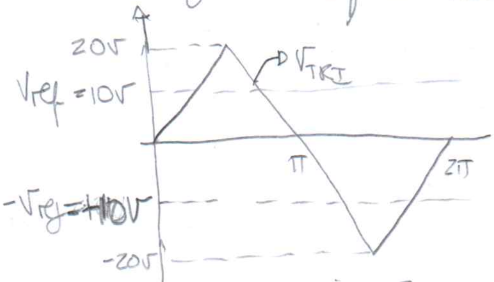


figure 2

a) [2,0 val] Represent the control signals of each one of the four [4] mosfet, assuring the correct temporal correspondence with signals of Figure 2.

b) [1,5 val] Based on answer of previous question, represent the output voltage waveform V_o (indicate the maximum and minimum values).

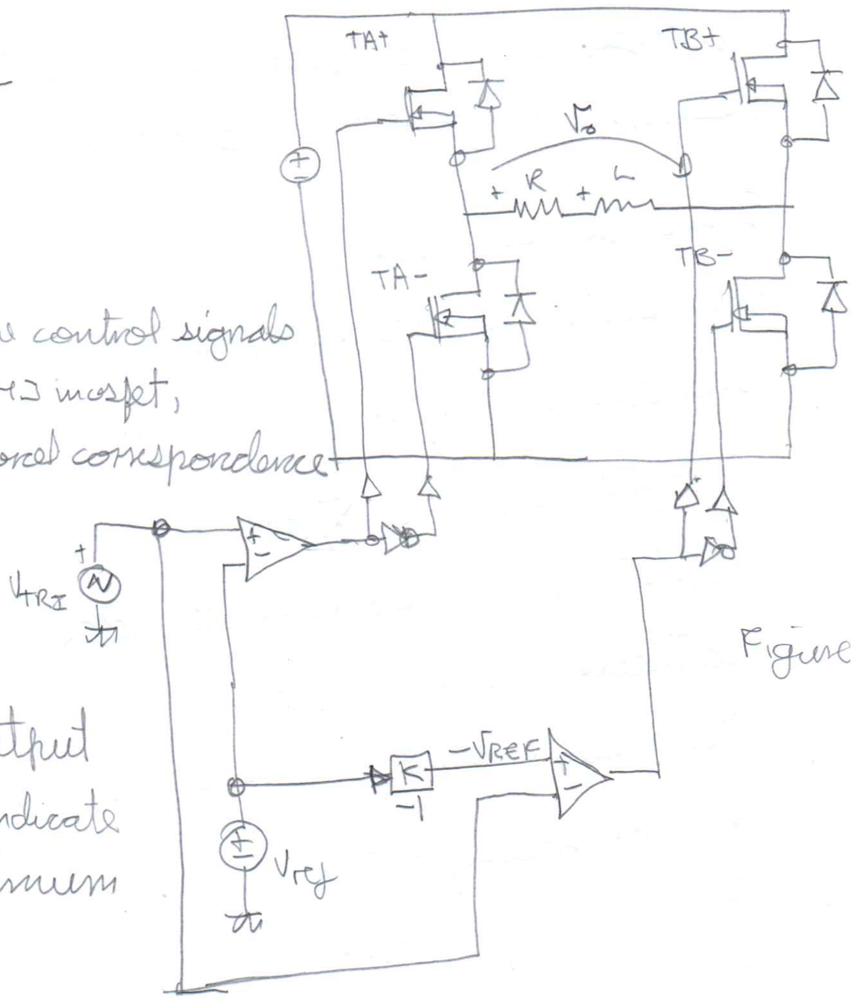


Figure 1