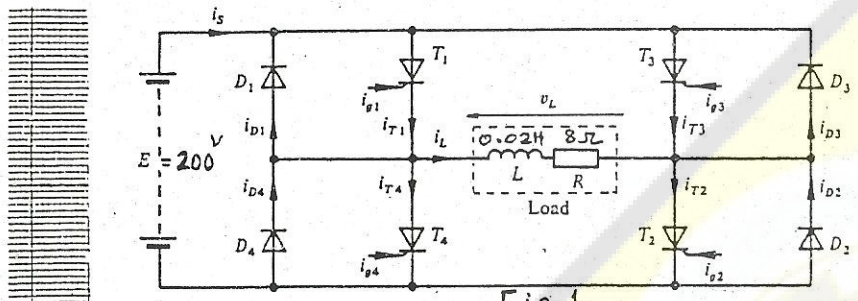


Fig. 1.

EE524 Power Electronics
Second Exam. 2.1.2001

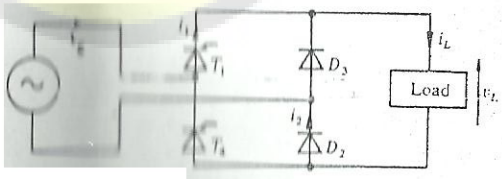
Q1) For the inverter circuit of Fig. 1, the load voltage is as indicated on the graph paper. Assuming ideal devices, and $I_L(0) = 0$:

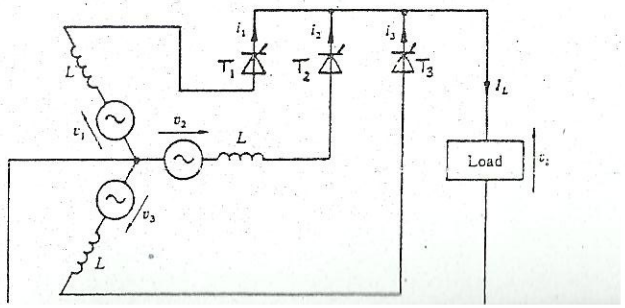
(a) Calculate and plot the load current waveform on the same time axis. **(20 pts.)**

(b) Specify, clearly, the devices that are conducting for each region. **(15 pts.)**

Q2) For the converter circuit of Fig. 2, the load is highly inductive, and the supply voltage is sinusoidal. Assuming ideal devices, determine the power factor of the supply current for $(V_L)_{mean} = 0.7\ (V_{Lo})_{mean}$, where $(V_{Lo})_{mean}$ is the dc output voltage when the firing angle $\alpha = 0°$. **(35 pts.)**

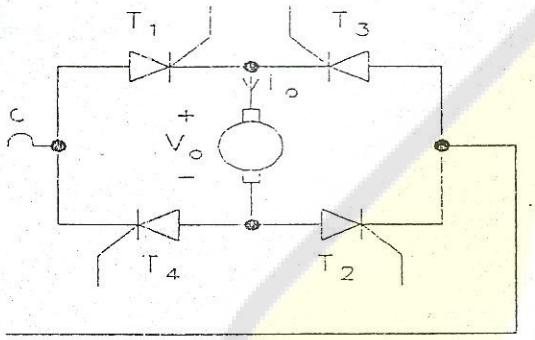
Q2) The circuit of Fig. 3, is supplied at a phase voltage of 220 V (rms), 50 Hz. The source inductance is 2 mH per phase. The load is highly inductive and consists of a 2.5 Ω resistance in series with a 0.5 H inductance. The required steady-state dc load current is 40 A. Calculate the value of the thyristors firing angle that produces this current. Assume each thyristor to have a volt-drop of 0.8 volts. **(30 pts.)**



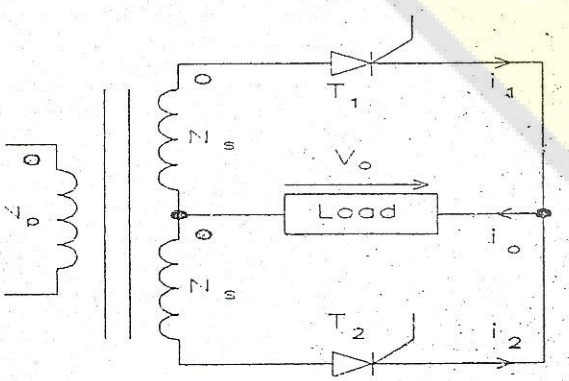


J. U. S. T.
EE 532 Power Electronics
Second Exam. 3.05.2004

. 1: (40 marks)
.e-phase bridge converter shown is con-
220 V (rms), 50 Hz supply. The converter
in the inversion mode at a firing advance
and a level current of 20 A. Determine (a)
drop due to the supply having a reactance
Ω , (b) the voltage drop due to thyristors
ıch thyristor has a voltage drop of 1.5 V,
ıge drop due to supply and lead resistance
) the mean generator voltage, (e) the over-
:) draw a dc equivalent circuit to represent
ɛr with its components clearly marked.

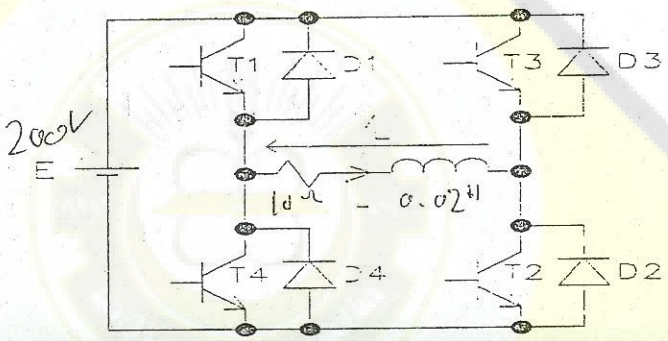


ı 2: (22 marks)
uit shown is supplied from a 220 V (rms),
e. The step-down transformer has identical
vindings with a turns ratio $N_p/N_s = 3.40$.
highly inductive, and consists of an induc-
).1 H in series with a resistance R = 10 Ω.
state load current is level at 5 A. Assuming
uit, determine the power factor of the sup-
i_p , its distortion factor and displacement



Problem 3: (38 marks)
The single-phase inverter shown supplies from a 200 V dc source a load of 10 Ω resistance in series with a 0.02 H inductance. The inverter is operating at 50 Hz, and its output is a square wave. The initial current in the load inductor is $I_L = -19.732$ A. Assuming ideal devices:

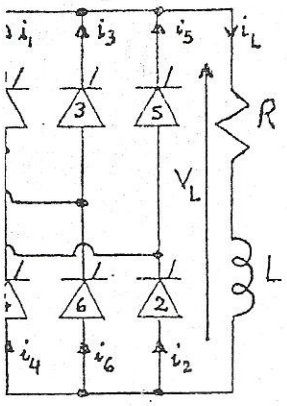
(a) Calculate and plot the load current and voltage waveforms on the same time axis for one cycle of operation only, (b) indicate on your plot the devices that are conducting in each region, (c) calculate the average power returned to the source, (d) what should be the peak voltage rating of the semiconductor devices while not conducting?

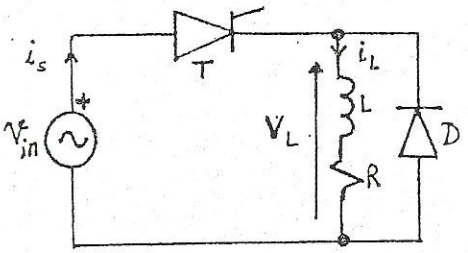


f = 50 , T = 20 ms

$I_{L0} = -19.732$

power factor of the supply current for the rectifier circuits shown in Figs. 1(a) and 1(b). nit losses and assume highly inductive load. Show your work. **(34 marks)**





.)

Fig. 1(b)

g. 2, the phase voltage is 220 V (rms), 50 Hz. The source inductance L_C is 2 mH. The ghly inductive. The required steady-state dc load current is 40 A. Each thyristor has a nd the value of the thyristors firing angle that produces the required load current, and alent circuit to represent the rectifier with its components clearly marked. **(34 marks)**

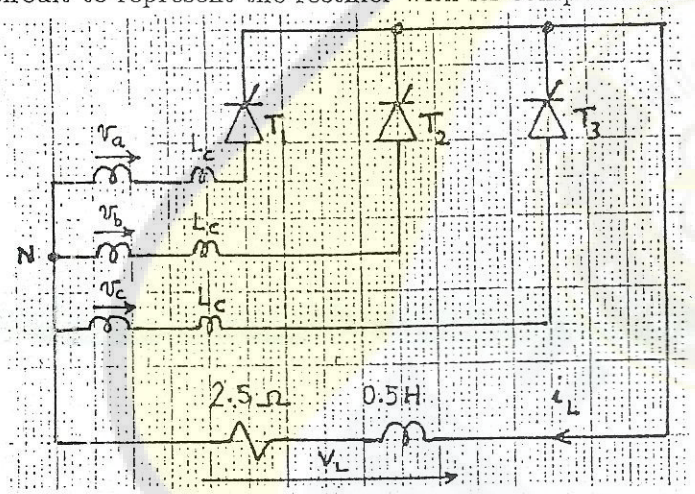


Fig. 3(a), the load is represented as an inductance L = 4 mH. The supply voltage is equency is 2 kHz. The steady state load voltage is shown in Fig. 3(b). Assuming that ing circuit losses: (a) Calculate and plot with clear labeling the steady state load current ne axis of Fig. 3(b). (b) Specify the devices that conduct in each region. **(32 marks)**

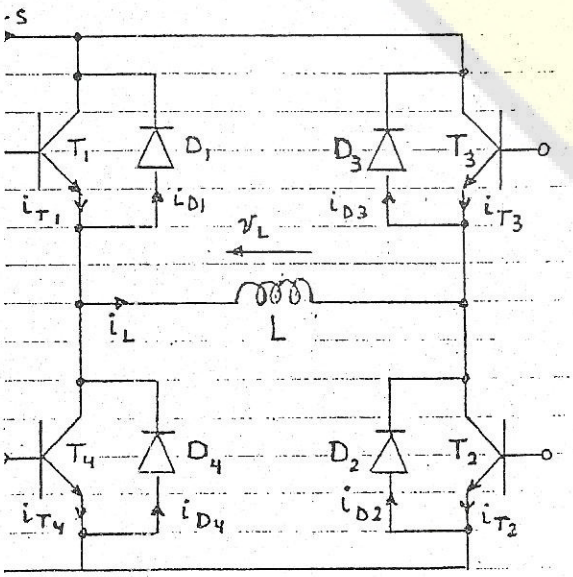


Fig. 3(a)

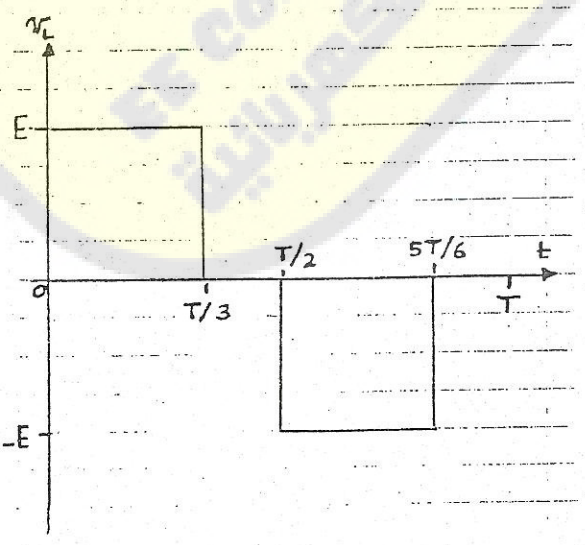


Fig. 3(b)