J.U.S.T.
EE532 Power Electronics
First Exam 15.11.2003

Problem 1 : *(9 pts.)*

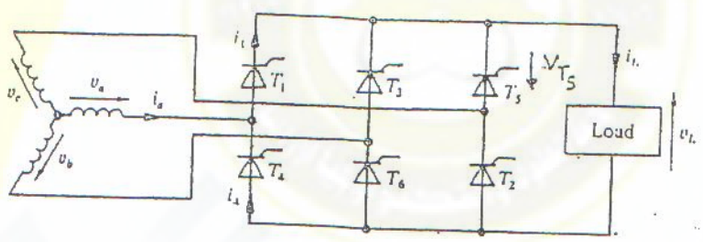
For the three-phase bridge circuit shown , the firing angle α is 60° for all thyristors. Assuming highly inductive load and ideal thyristors, plot on the same time axis with CLEAR labeling the waveforms for:

(a) load voltage v_L

(b) thyristor 5 voltage v_{T5}

(c) thyristor 1 current i_1

NOTE: Use the graph paper provided.



Problem 2 : *(9 pts.)*

A highly inductive DC load requires 10 A at 120 V from a 220 V (rms) single-phase AC supply. Give design details for this requirement using a diode bridge rectifier. Assume negligible voltage drop on the devices. In your design you should specify:

(a) diode rms current and PIV ratings.

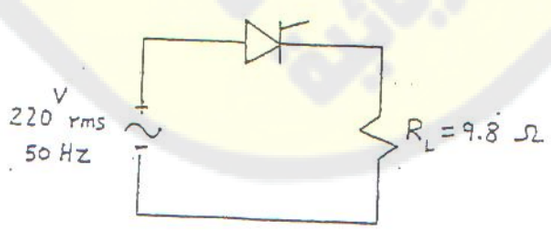
(b) transformer primary and secondary kVA.

Problem 3 : *(7 pts.)*

For the circuit shown below, the supply voltage is 220 V (rms), and it is required to deliver 1 kW to the resistive load R_L .

(a) calculate the thyristor firing angle α to achieve this. Neglect drop on the thyristor.

(b) determine the thyristor peak reverse voltage.



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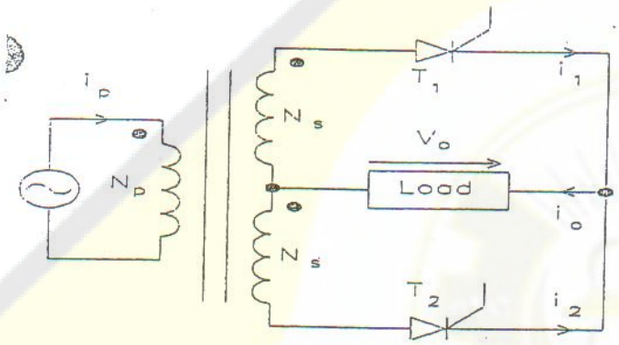
EE 532 Power Electronics
First Exam 7.04.2004

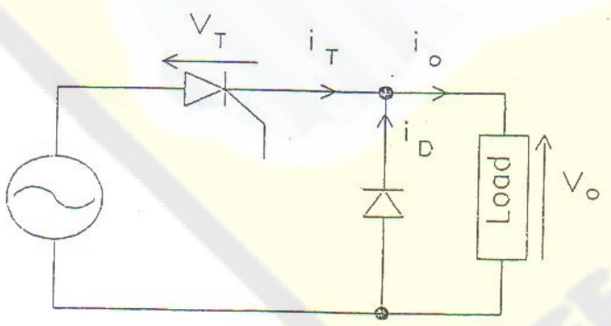
Problem 1: (34 marks)

The circuit shown is supplied by a 220 V (rms) at 50 z. The step-up transformer has identical secondary indings with a turns ratio $N_s/N_p = 6.4$. The load highly inductive, and consists of an inductance L 0.5 H in series with a resistance R = 2.5 Ω. The eady state load current is 400 A dc. Assuming ideal evices and transformer: (a) calculate the value of the yristors firing angle that produces the required load rrent, (b) what is the frequency of the output voltage pple? (c) determine the peak reverse voltage (PRV), id the rms current ratings of the thyristors, (d) calcute the supply rms current, (e) determine the primary id secondary KVA ratings of the transformer.



Problem 2: (30 marks)

A highly inductive dc load requires 10 A at 75 V om a 220V (rms), 50 Hz supply. The circuit shown to be used. Assuming ideal devices: (a) calculate ie thyristor firing angle that produces the required ad current, (b) what is the frequency of the output oltage ripple? (c) determine the peak reverse voltage d rms current ratings of the devices, (d) calculate ie supply rms current.

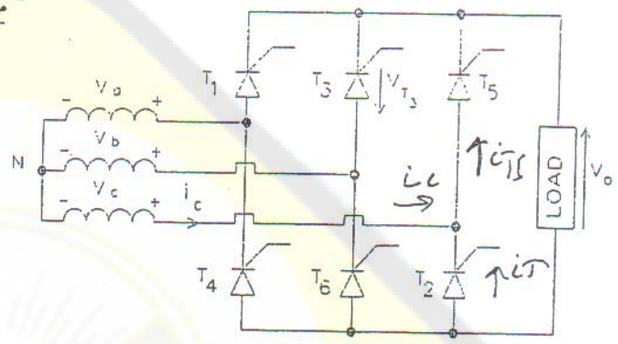


Problem 3: (36 marks)

For the 3-phase circuit shown, the firing angle is 75° for each of the thyristors. Assuming a highly inductive load and ideal thyristors plot on the same time axis with clear labeling the steady-state waveforms for:

(a) the load voltage v_o
(b) phase C current i_c
(c) thyristor 3 voltage v_{T3}

Note: For plotting, use the graph paper provided.



$i_c + i_{T2} = i_{T5}$

$i_c = i_{T5} - i_{T2}$

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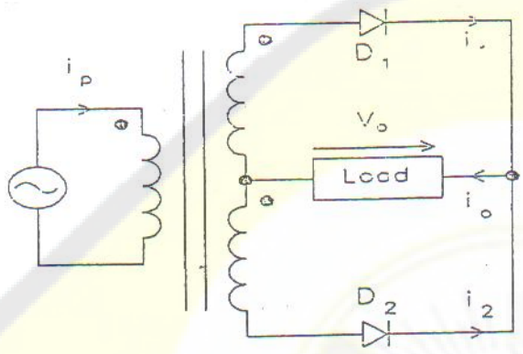
EE532 Power Electronics
First Exam 17.11.2002

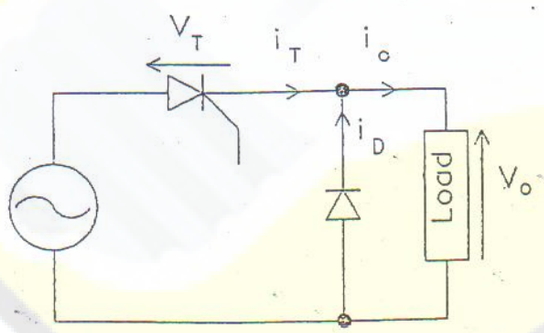
Question 1 : (9 pts.)

A highly inductive dc load requires 12 A at 150 V from a 110 V (rms), 60 Hz supply. Give complete design details for this requirement using the circuit shown below which employs ideal diodes and transformer.



Question 2 : (8 pts.)

For the circuit shown below, the load is highly inductive and can be modelled as an inductance of 1 H in series with a resistance of 7.5 Ω. The circuit is supplied from a 220 V (rms), 50 Hz source . Assuming that the load requires a dc current of 10 A, calculate the thyristor firing angle α to achieve this, then determine the thyristor and diode rms currents at this firing angle. Neglect voltage drop on the semiconductors.



Question 3 : (8 pts.)

For the 3-phase circuit shown below, the firing angle α is 45° for each of the thyristors. Assuming a highly inductive load and ideal thyristors plot on the same time axis with clear labeling the steady-state waveforms for:

(a) the load voltage v_o
(b) thyristor 2 current i_2
(c) thyristor 3 voltage v_{T3}

Note: For plotting, use the graph paper provided.