

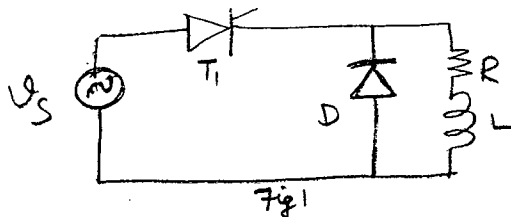
B.E END SEMESTER EXAMINATION NOV/DEC 2012
ELECTRICAL AND ELECTRONICS ENGINEERING BRANCH
V SEMESTER –REG 2008
EE 9301- POWER ELECTRONICS

TIME:3 HRS

MARKS:100

PART A (10 X 2 =20MARKS)

- 1 Find the form factor for the circuit given in fig 1.



2. What type of load is required for a single phase full converter to operate in the second quadrant? Explain.
3. Explain integral cycle control of ac voltage controllers.
4. Draw the voltage waveform of single phase cycloconverter feeding RL load for $\omega = \omega_s/2$ for discontinuous current conduction.
5. With current limit control explain whether the chopper operates in constant or variable frequency mode.
6. Derive the ripple factor for class A chopper feeding R load.
7. Explain the difference between feedback diodes and freewheeling diodes.
8. For a single phase half bridge inverter draw the load voltage and load current waveform for RL load and mark the conduction of devices.
9. Explain what is circuit turn off time and how it is affected by overlap angle.
10. Which of the following devices SCR, TRIAC, MOSFET and IGBT are used for switched mode power supplies? Give reasons.

PART B (5 X 16 = 80 MARKS)

11. A single phase full converter charges a battery which offers a constant value of E . A resistor R is inserted to limit the charging current. Derive an expression for the average charging current in terms of V_m, E, R on the assumption that each pair of thyristors are fired continuously in each half cycle. Find the value of R in case battery charging current is 6 A, supply voltage is 40 V, 50 Hz and $E=12$ V.

- 12.a.(i) Explain with two transistor analogy how SCR is latched. (8)

- (ii) A single phase full converter fed from 220 V, 50 Hz supply gives an output voltage of 100 V at no load. When loaded with constant output current of 10 A, the ripple factor is found to be 6. Compute the value of source inductance in mH. (8)

(OR)

- (i) For a three phase semiconverter. Draw the load voltage, load current waveforms for $\alpha = 45^\circ$. Derive an expression for average voltage.

in terms of α . Prove that semiconverter has inherent freewheeling action for $\alpha > \pi/3$ with load voltage waveform.

- 13.a. Explain the different modes of operation of boost converter with waveforms. Derive expressions for L and C in terms of current ripple and output voltage ripple.

(OR)

- 13.b. For load operating in forward motoring and regeneration mode which chopper is preferred? Explain the operation of the chopper circuit with waveforms.

- 14.a. Single phase to single phase cycloconverter of midpoint type is used for obtaining an output frequency $f_o = 1/3 f_s$. Turns ratio from primary to upper secondary is 1:1 and to a lower secondary is 1/n. Derive expression for the rms value of the output voltage for firing angle α . For $V_s = 230$ V, 50 Hz, $R = 20 \Omega$ and $\alpha = 45^\circ$, find the load power.

(OR)

- 14.b.(i) For a two stage sequence controlled ac voltage controller feeding R load draw the load voltage and load current waveforms for $\alpha = 45^\circ$. Derive the expression for rms value of the output voltage in terms of α . (10)

- (ii) Explain the operation of single phase sinusoidal voltage controller. (6)

- 15.a.(i) Explain 180 degree mode of conduction of 3 phase inverter with phase and line to line voltage waveforms. (8)

- (ii) Explain multiple modulation and sinusoidal modulation techniques (8)

(OR)

- 15.b. (i) Explain the operation of Modified series resonant inverter. Explain how the drawbacks of basic series inverter are overcome in this inverter. (8)

- (ii) Explain how harmonic reduction is done by transformer connections and stepped inverters (8)