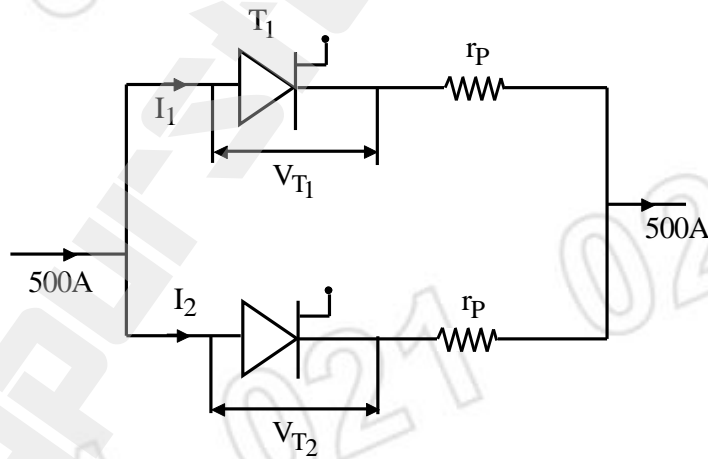




- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data whenever necessary.
  10. Illustrate your answers whenever necessary with the help of neat sketches.
  11. Use of non programmable calculator is permitted.

1. a) What are the methods of triggering a series connected SCRs? Explain one of the method in brief. 7
- b) Two thyristors, one having the current rating of 300A & a forward voltage drop  $V_{T1} = 0.5 + 0.02I_1$  volts & the other having a current rating of 200 A & a forward voltage drop  $V_{T2} = 0.7 + 0.035 I_2$  volts are connected in parallel. Calculate the value of resistance  $r_p$  which should be connected in series with each SCR so that they share a current of 500 A. as per their rated values. 6

**OR**

2. a) Give broad classification of commutation techniques & explain any one of them. 7
- b) Explain  $\frac{dv}{dt}$  &  $\frac{di}{dt}$  limitations of an SCR & explain how these limitations are improved by using external components. 6
3. a) Explain how the control of Ac power is possible with the help of TR/AC. 7

b) Write short note on Optocouplers.

6

OR

4. a) Draw a UJT circuit as relaxation oscillator. Explain the working in brief with UJT characteristics

7

b) An SCR is to be gated by using a relaxation oscillator which has a UJT with the characteristics  $\eta = 0.7$ ,  $I_p = 0.7 \text{ mA}$ ,  $V_p = 16.5 \text{ V}$  normal leakage current with emitter open  $= 3.7 \text{ mA}$ ,  $V_v = 1.0 \text{ V}$ ,  $I_v = 6 \text{ mA}$  &  $R_{b1} R_{b2} = 5.5 \text{ k}\Omega$ . The firing frequency is  $1000 \text{ Hz}$ . If capacitance  $C = 0.1 \mu\text{f}$ . Calculate the values of  $R$ ,  $R_1$  &  $R_2$ .

6

5. a) Prove that reactive power requirement of 1phase fully controlled converter is reduced to 50% if FWD is connected across load. Also state the advantages of FWD.

7

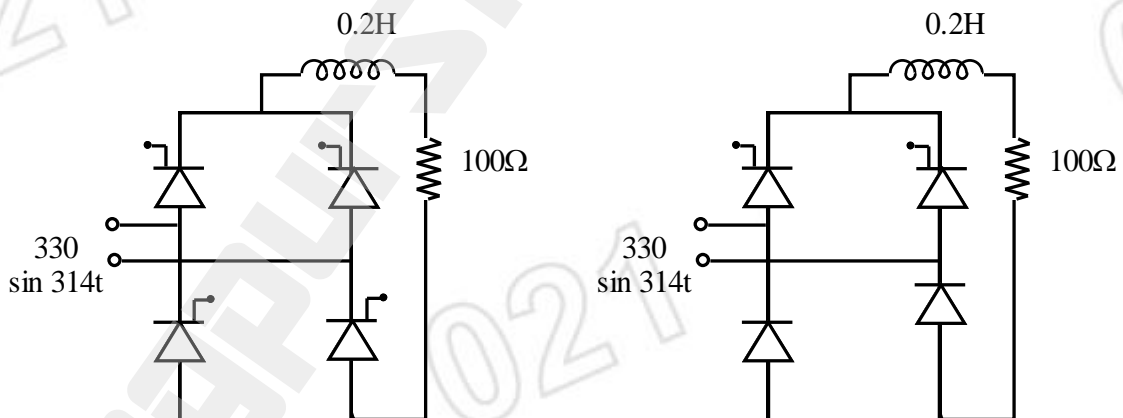
b) A 3-phase six pulse fully controlled converter is connected to a 3phase Ac supply of  $400 \text{ V}$  &  $50 \text{ Hz}$  & operates with a firing angle  $\alpha = \frac{\pi}{4}$ . The load current is maintained constant at  $10 \text{ A}$  & the load voltage is  $360 \text{ V}$ . Calculate the load resistance, source inductance & the overlap angle.

7

OR

6. a) Calculate the average current for the circuits shown in fig below when the supply voltage, is  $330 \sin 314t$ . The firing angle  $\alpha$  for the SCRS is  $\frac{\pi}{4}$ . Assume the load current to be constant & continuous & neglect source reactance which of the two circuits shown in fig will give better power factor? Explain.

7



b) What is an overlap angle  $\mu$ ? Explain its effect on the output of converter.

7

7. Write short note on.

a) Cycloconverters -principle of operation.

7

b) Input power factor improvement in controlled rectifier.

6

OR

8. a) Explain speed control of a dc motor using SCR phase controlled converter below & above rated speed. Draw suitable waveforms. 7
- b) Explain single phase line commuted inverter in brief. 6
9. a) What is multiphase chopper? How does it overcome the drawback of line filter chopper? 7
- b) Write a short note on four quadrant chopper. 7

**OR**

10. a) Draw & explain half bridge & full bridge configuration of series resonant inverter. 7
- b) A step up chopper is used to deliver load voltage of 500V from a 220V d.c source. If the blocking period of the thyristor is 80  $\mu$  sec. Compute the required pulse width. 7
11. a) What are the limitations of basic series inverter? Explain modified improved series inverter with neat circuit diagram. 7
- b) Explain 3-phase bridge inverter for 120°. Mode of conduction Draw all relevant waveforms. 6

**OR**

12. a) A 1 phase full bridge inverter has a resistive load of  $R = 3 \Omega$  &  $E_{dc} = 50V$  compute 7
- i) RMS output voltage at a fundamental frequency  $E_1$
- ii) Output power  $P_o$
- iii) Average & peak current of each thyristor &
- iv) Peak reverse blocking voltage of each thyristor.
- b) A 3 -  $\phi$  inverter is supplied from a 600 V source for a star connected resistive load of 15  $\Omega$ /phase find the RMS load current, load power & the thyristor ratings for 6
- i) 120° conduction
- ii) 180° conduction.

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