

**PDFZilla – Unregistered**

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Total No. of printed pages = 4

**EE 131503**

Roll No. of candidate

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**2017**

**B.Tech. 5th Semester End-Term Examination**

**Electrical**

**POWER ELECTRONICS**

Full Marks – 100

Time – Three hours

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The figures in the margin indicate full marks  
for the questions.

Answer Question No. 1 and any *six* from the rest.

1. Answer the following questions : (10 × 1 = 10)
- (a) What do you mean by 'firing' of SCR?
  - (b) Define GTO.
  - (c) Draw the VI characteristics of a power diode.
  - (d) What do you mean by reverse recovery time?
  - (e) What is the use of freewheeling diode?
  - (f) How thyristor can be brought from forward blocking mode to forward conduction mode?
  - (g) Name modes of operation of inverter.

**[Turn over**

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- (h) Define duty cycle.
- (i) Write the application of cycloconverter.
- (j) Define latching current of SCR.
2. (a) Give the expressions for String efficiency and Derating factor for a series of SCRs. (4)
- (b) What is meant by  $dv/dt$  triggering of an SCR and the necessary protection against it? (5)
- (c) A 0.5 kV, 1500 A power electronic circuit is to use SCRs of 400 V and 100 A rating. Use a derating factor of 0.3. Find the number of SCR in series and parallel. (6)
3. (a) How a power diode is different from a signal diode? (3)
- (b) Derive the relation between  $\alpha$  and  $\beta$  for a BJT. (5)
- (c) Draw and explain the switching characteristics of a diode, also explain the reverse recovery time. (7)
4. (a) What are AC voltage controllers? Name its types according to controlling strategies. (4)
- (b) Explain the working of phase control of AC voltage controller. (5)
- (c) A single phase half wave AC voltage controller feeds a load of  $R = 20 \Omega$  with an input voltage of 230 V, 50 Hz. Firing angle of thyristor is  $45^\circ$ . Determine :
- (i) rms value of output voltage
- (ii) power delivered to load and input power factor. (6)

5. (a) Name the methods of twining on a SCR and explain briefly any one of them. (1 + 4 = 5)
- (b) Draw the VI characteristics of a SCR and mark. (4)
- (i) Latching and holding current
- (ii) Forward and reverse blocking regions
- (iii) Forward on state voltage drop
- (iv) Cut-in voltage
- (c) For a SCR, the gate-cathode characteristic has a straight line slope of 130. For trigger source voltage of 15 V and allowable gate power dissipation of 0.5 watts, compute the gate-source resistance. (6)
6. (a) Write the difference between a DIAC and a TRIAC with the help of a table. (4)
- (b) Explain RC triggering circuit with neat diagram and waveform. (5)
- (c) A step up chopper has input voltage of 220 V and output voltage of 660 V. If the conducting time of the thyristor chopper is  $100 \mu\text{sec}$ , compute the pulse width of output voltage.
- In case output voltage pulse width is halved for constant frequency operation, find the average value of new output voltage. (6)
7. (a) What do you mean by commutation of SCR? Name the various techniques of commutation. (4)
- (b) Explain Class C-complimentary commutation circuit. (5)
- (c) Explain the working of a Dual converter. (6)

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8. (a) What are rectifiers? (2)
- (b) Draw and explain the circuit diagram and necessary waveforms  $V_S$ ,  $V_O$ ,  $I_O$ ,  $V_T$  for a single phase full-wave bridge rectifier with RL load. (5)
- (c) What are cyclo-converters? Explain a mid-point type single phase step-up cyclo-converter with neat circuit diagram and waveform. (2 + 6 = 8)
9. (a) What is SMPS? Write short note on 'SMPS'. (3)
- (b) Explain "Jones chopper" with circuit diagram. (5)
- (c) Describe with relevant diagrams the 180° mode of operation of a 3-phase bridge type inverter, assuming a star connected load. (7)
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