



**SIDDHARTH GROUP OF INSTITUTIONS::PUTTUR(A  
AUTONOMOUS)**

SiddharthNagar,NarayanavanamRoad -517583

**QUESTIONBANK(DESRIPTIVE)**

**SubjectwithCode:**PowerElectronics(19EE0210)

**Course&Branch:**B.Tech&EEE

**Year&Sem:**III-B.Tech&I-Sem

**Regulation:**R19

**UNIT-I**

**POWER SWITCHING DEVICES**

- 1) Explain the Types of Power Semiconductor Devices and Mention Advantages, Applications of Power Semi-Conductor Devices? [CO2,L2][10M]
- 2) a) Explain V-I Characteristics of Power Diode? [CO3,L2][5M]  
b) Necessity of Commutation, What are the Types of Commutation? [CO2,L2][5M]
- 3) Draw and explain V-I characteristics of SCR and its working. [CO3,L4][10M]
- 4) Briefly explain about Insulated Gate Bipolar Transistor (IGBT) and its switching characteristics. [CO3,L2][10M]
- 5) Explain the Resistance firing circuit with the necessary waveforms. [CO2,L2][10M]
- 6) Briefly explain about Metal Oxide Semiconductor Field Effect Transistor (MOSFET) and its switching Characteristics. [CO3,L3][10M]
- 7) Explain briefly voltage commutation and Draw the output waveforms. [CO2,L2][10M]
- 8) Analyze the MOSFET using its output and transfer Characteristics. [CO3,L5][10M]
- 9) Explain briefly current commutation and Draw the output waveforms. [CO2,L2][10M]
- 10) A bipolar transistor has current gain  $\beta = 40$ . The load resistance  $R_c = 10 \text{ ohm}$ , dc supply voltage  $V_{CC} = 130 \text{ v}$  and input voltage to base circuit  $V_B = 10 \text{ v}$ . For  $V_{CES} = 1 \text{ v}$  and  $V_{BES} = 1.5 \text{ v}$  calculate,
  - a) The value of  $R_B$  for operation in the saturated state
  - b) The value of  $R_B$  for an overdrive factor 5. [CO3,L3][10M]
  - c) Forced current gain and
  - d) Power loss in the transistor.

**UNIT-II****RECTIFIERS**

- 1) Explain the operation of single phase half wave converter with R-load at  $\alpha=60^\circ$  with necessary waveforms. Also derive the output voltage, output current and RMS output voltages. [CO6,L3][10M]
- 2) Explain the operation of single phase Full wave converter with R-load with necessary waveforms. Also derive the output voltage, output current and RMS output voltages. [CO6,L2][10M]
- 3) a) List the different applications of phase controlled converters. [CO2,L2][5M]  
b) What is the difference between half controlled and fully controlled bridge rectifier. [CO1,L5][5M]
- 4) A single phase half wave converter is operated from a 230V, 50Hz supply. If the load is Resistive of value 10ohms and firing angle is  $60^\circ$  Determine  
i) the rectification efficiency  
ii) form factor  
iii) ripple factor  
iv) Transformer utilization factor [CO6,L3][10M]  
v) Peak inverse voltage of thyristor.
- 5) Analyze the average and RMS load voltage of single phase fully controlled rectifier with RL load. [CO6,L5][10M]
- 6) Explain the operation of Three phase fully controlled rectifier with RL load and also derive the average and RMS load voltage. [CO6,L2][10M]
- 7) Explain the operation of single phase half wave converter with RL-Load with necessary wave forms. Also derive the output voltage, output current and RMS output voltages. [CO6,L2][10M]
- 8) Analyze the output voltage, output current & RMS voltage equations of single phase full Bridge converter with RL load. [CO6,L3][10M]
- 9) Explain the operation of Three phase fully controlled rectifier with R load and also derive the average and RMS load voltage. [CO6,L2][10M]
- 10) a) A single phase full converter is made to deliver a constant load current. For zero degree firing angle, the overlap angle is  $15^\circ$ , calculate the overlap angle when firing angle is a)  $30^\circ$  b)  $45^\circ$  and c)  $60^\circ$  [CO6,L3][5M]  
b) What is the difference between half controlled and fully controlled bridge rectifier. [CO1,L2][5M]



**UNIT-III**  
**CHOPPERS**

- 1) Derive the expression for output voltage of step down chopper with neat diagrams. [CO6,L2][10M]
- 2) a) Describe the principle of dc chopper operation. [CO2,L2][5M]  
 b) Derive an expression for its averaged dc output voltage. [CO5,L2][5M]
- 3) The buck converter has an input voltage of  $E_{dc}=12V$ . the required average output voltage is  $E_o=5V$ . At  $R=500\Omega$  and the peak-to-peak output voltage is  $20mV$ , the switching frequency is  $25kHz$ . if the peak-to-peak ripple current of inductor is limited to  $0.8A$ , determine  
 (a) the duty cycle  
 (b) the filter inductance  $L$  and  
 (c) the filter capacitor  $C$ , and  
 (d) the critical values of  $L$  and  $C$ . [CO5,L3][10M]
- 4) What is a dc chopper? Describe various types of chopper configurations. With appropriate diagram wherever necessary. [CO1,L4][10M]
- 5) Explain about Control Techniques of choppers in details. [CO5,L2][10M]
- 6) Explain the buck converter operation with help of diagram and also draw the output waveforms. [CO6,L2][10M]
- 7) Analyze elementary operation of chopper with waveforms. [CO5,L5][10M]
- 8) Explain the boost converter operation with help of diagram and also draw the output waveforms. [CO6,L2][10M]
- 9) The boost converter has an input voltage of  $E_{dc}=5V$ . the required average output voltage is  $E_o=15V$ . And the average load current  $I_o=0.5A$ . The switching frequency is  $25kHz$ . If the  $L=150\mu H$  and  $C=220\mu F$ , Determine  
 (a) the duty cycle  
 (b) the ripple current of inductor  $\Delta I$   
 (c) the peak current of inductor  $I_L$ ,  
 (d) The ripple voltage of filter capacitor  $\Delta V_C$ , and  
 (e) the critical values of  $L$  and  $C$ . [CO5,L3][10M]
- 10) a) For step down chopper dc source voltage is  $230V$ , load resistance is  $10\Omega$ . The voltage drop across chopper when it is in ON is  $2V$ . For a duty cycle of  $0.4$ . Calculate  
 i) average and rms values of output voltage  
 ii) chopper efficiency. [CO5,L3][7M]  
 b) List some applications of dc chopper? [CO1,L2][3M]

**UNIT-IV****CYCLO CONVERTERS**

- 1) Explain the principle of operation of single phase to single phase step-up midpoint cycloconverter .  
[CO2,L2][10M]
- 2) Explain the operation of single phase to single phase bridge type step-down cycloconverter with R-L Load for continuous conduction mode. [CO2,L2][10M]
- 3) a) What is meant by load commutated cycloconverter? [CO1,L2][10M]  
b) Draw and explain bridge type step-down cycloconverter with R Load. [CO4,L4][10M]
- 4) The input voltage to the cycloconverter is 120V (r.m.s),50Hz. The load resistor is  $5\Omega$  and the inductance is  $L=40$  mH. The frequency of the output voltage is 25Hz. If the converters are operated as semiconverters such that  $0 \leq \alpha \leq$  the delay angle is determine:  
(a) The rms value of the output voltage.  
(b) The rms value of the load current .(c) The input power factor. [CO4,L3][10M]
- 5) Explain the operation of single phase to single phase bridge type step-up cycloconverter with continuous mode. [CO4,L2][10M]
- 6) Draw and explain bridge type step-up cycloconverter with R-L Load for discontinuous conduction mode. [CO4,L4][10M]
- 7) a) Draw and explain midpoint type step-down cycloconverter with R Load. [CO4,L4][10M]  
b) What are the applications of cycloconverter. [CO1,L2][10M]
- 8) single-phase bridge-type cycloconverter has input voltage of 230V and 50Hz and load of  $R = 10\Omega$ . Output frequency is one-third of input frequency. For a firing angle delay of  $300^\circ$ , calculate  
(a) RMS value of output voltage  
(b) RMS current of each converter  
(c) RMS current of each thyristor and  
(d) input power factor. [CO4,L3][10M]
- 9) Explain the principle of operation of single phase to single phase step-down midpoint cycloconverter.  
[CO6,L2][10M]
- 10) Draw and explain bridge type step-down cycloconverter with R-L Load for discontinuous conduction mode. [CO6,L4][10M]

**UNIT-V****AC VOLTAGE CONTROLLERS**

- 1) Explain the operation of single phase full wave ac voltage controller with resistive load. [CO6,L2][10M]
- 2) Draw and Explain the operation of single phase full wave ac voltage controller with R-L load.  
[CO6,L2][10M]
- 3) Briefly explain the operation of TRIAC in different modes. [CO6,L2][10M]
- 4) A single phase voltage controller is employed for controlling the power flow from 230V, 50Hz source into a load circuit consisting of  $R=3\ \Omega$  and  $L=4\ \Omega$ . Calculate [CO4,L3][10M]
  - (i) the range of firing angle
  - (ii) the maximum value of rms load current
  - (iii) the maximum power and power factor (iv) The maximum values of average and rms thyristor currents.
- 5) a) What is meant by ac voltage controllers and what are the different types? [CO2,L2][5M]  
b) List the applications of ac voltage controller. [CO1,L2][5M]
- 6) Explain the operation of TRIAC with R and R-L loads. [CO4,L2][10M]
- 7) Explain about the single phase half wave ac voltage controller with resistive load. [CO4,L2][10M]
- 8) A single phase half wave ac voltage controller feeds a load of  $R=20\ \Omega$  with an input voltage of 230V, 50Hz. Firing angle of thyristor is  $45^\circ$ . Determine
  - a) rms value of output voltage
  - b) power delivered to load and input pf and
  - c) average input current. [CO4,L3][10M]
- 9) a) Draw and Explain V-I Characteristics of TRIAC. [CO1,L4][6M]  
b) What are the advantages and disadvantages of ac voltage controller? [CO1,L2][4M]
- 10) Explain the operation of TRIAC firing circuit. [CO2,L2][10M]

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