



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

Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code :Power Electronics(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 it's 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 it's switching Characteristics. [CO3,L3][10M]
- 7) Explain briefly voltage commutation and Draw the output wave forms. [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 wave forms. [CO2,L2][10M]
- 10) A bipolar transistor has current gain $\beta = 40$. The load resistance $R_c=10$ ohm, dc supply voltage $V_{cc}=130$ v and input voltage to base circuit $V_B =10$ v. For $V_{CES} = 1$ v and $V_{BES}=1.5$ v calculate,
 - a) The value of R_B for operation in the saturated state
 - b) The value of R_B for an over drive 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 $\alpha=60$ with necessary wave forms. 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 wave forms. Also derive the output voltage, output current and RMS output voltages. [CO6,L2][10M]
- 3) a) List the different application 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 10 ohms and firing angle is 60° 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° , calculate the overlap angle when firing angle is a) 30° b) 45° and c) 60° [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 average 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 Voltage Control Techniques for Inverters. [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 25 kHz. If the $L=150\mu H$ and $C=220\mu F$, Determine
 - (a) the duty cycle
 - (b) the ripple current of inductor ΔI
 - (c) the peak current of inductor I_L ,
 - (d) The ripple voltage of filter capacitor ΔV_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 ohm. 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][4M]
b) Draw and explain bridge type step-down cycloconverter with R Load.
[CO4,L4][6M]
- 4) The input voltage to the cycloconverter in Fig.2 is 120 v (r.m.s),50Hz. The load resistor is 5Ω 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][6M]
b) What are the applications of cycloconverter.
[CO1,L2][4M]
- 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° , 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 $R=20\ \text{ohm}$ with an input voltage of 230v, 50Hz. Firing angle of thyristor is 45° . Determine
 - a) rms value of outputvoltage
 - 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]

Prepared by: **V.MANASA**