SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
(AUTONOMOUS)
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QUESTION BANK (DESCRIPTIVE)

Subject with Code : Power Electronics(16EE219) **Course & Branch**: B.Tech&EEE

Year &Sem:III-B.Tech&I-Sem   **Regulation:** R16

UNIT –I

POWER SEMICONDUCTING DEVICES AND COMMUTATION CIRCUIT

1		Explain the dynamic characteristics of SCR with neat waveforms.	12M
2		Draw and explain V-I characteristics of SCR and its working.	12M
3	a)	Explain the types of power electronic converters.	6M
	b)	Write short note on applications of power electronic converters.	6M
4	a)	Describe input and transfer characteristics of an IGBT.	8M
	b)	Define Latching current and Holding current.	4M
5		Explain the two transistor analogy of the thyristor with neat diagrams.	12M

6   A bipolar transistor has current gain $\beta = 40$. The load resistance Rc=10 ohm, dc supply   **12M**
voltage V_{CC} =130v and input voltage to base circuit V_B =10v. For V_{CES} = 1v and V_{BES} =
1.5v 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.

c) Forced current gain and

d) Power loss in the transistor.

7		Explain working principle and characteristics of MOSFET.	12M

8   a) For an SCR, the gate cathode characteristics have a straight line slope of 130. For trigger   **6M**
source voltage of 15V and allowable gate power dissipation of 0.5 watts, compute the
gate source resistance.

	b	Write short note on applications of various types of power electronic converter.	6M
9		Explain about series and parallel operation of thyristors.	12M
10	a)	Explain the switching characteristics of BJT.	6M
	b)	Write short note on Turn on methods of SCR.	6M

UNIT-II

PHASE CONTROLLED CONVERTERS

1	Explain the operation of single phase half wave converter with R-Load at α=60 with necessary wave forms. Also derive the output voltage and output current.	12M
2	a) Give the difference between midpoint and bridge type converters	6M
	b) Give the difference between discontinuous mode and continuous mode of operation.	6M
3	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.°	6M
	b) What is the difference between half controlled and fully controlled bridge rectifier.	6M
4	A single phase half wave converter is operated from a 230V, 50Hz supply. If the load is Resistive of value 10 ohms and delay angle is 60.° Determine	12M

        i)   the rectification efficiency
        ii)   form factor
        iii)   ripple factor
        iv)   Transformer utilization factor
        v)   peak inverse voltage of thyristor.

5	Explain the operation of single phase fully controlled rectifier with RL load and also derive the average and RMS load voltage.	12M
6	What are the effects of source inductance in single phase controlled rectifier?	12M
7	What is a freewheeling diode? Draw single phase semi converter with RLE load with freewheeling diode and explain the operation with necessary output waveforms.	12M
8	Explain the operation of single phase full wave midpoint converter with RL load. Also derive the output voltage and output current equations.	12M
9	a) A single phase full converter feeds power to RLE load with R=6ohm, L=6mH and E=60V. The ac source voltage is 230V, 50Hz. For continuous conduction, find the average value of load current for a firing delay of 50.° In case one of the four SCRs gets open circuit due to a fault, find the new value of average load current taking the output current as continuous	6M
	b) List the different application of phase controlled converters.	6M
10	Explain the operation of single phase fully controlled rectifier with R load and also derive the average and RMS load voltage.	8M

UNIT –III
THREE PHASE LINE COMMUTATED CONVERTERS

1	Explain the operation of three phase dual converter with circulating current type.	12M
2	A three phase half wave rectifier is operated from three phase star connected 208V, 60Hz supply. Load resistance =10 Ohm. If it is required to obtain an average output voltage 50 % of max possible output voltage. Calculate i) delay angle ii) rms value of output current iii) average value of output current iv) thyristor avg and rms current v) efficiency vi)TUF vii) supply power factor.	12M
3	Explain the effect of source inductance in the operation of three phase fully controlled converter.	12M
4	Explain the operation of three phases fully controlled converter with RLE load. Sketch the associated waveforms. Also derive the output equations for firing angle 0^0.	12M
5	Explain the operation of three phase M-3 converter with R load. Sketch the associated waveforms.	12M
6	At firing angle of 120^0, explain the operation of three phases fully controlled converter with RLE load with necessary waveform.	12M
7	Three phase fully controlled rectifier is connected to three phase ac supply of 230V, 60 Hz. load current is continuous and has a negligible ripple. If the average load current I_{dc} =150 A and the commutating inductance L_c = 0.1mH. Determine the overlap angle when α = 10°.	12M
8 a)	Give the difference between discontinuous mode and continuous mode of operation.	6M
b)	Give the difference between midpoint and bridge type converters.	6M
9	Explain the operation of single phase dual converter with circulating and non-circulating current type	12M
10	Explain the operation of three phase dual converter with non- circulating current type.	12M

UNIT-IV

AC VOLTAGE CONTROLLERS AND CYCLO CONVERTERS

1		Briefly explain the operation of TRIAC in different modes.	12M
2	a	What is meant by ac voltage controllers and what are the different types?	8M
	b	List the applications of ac voltage controller.	4M
3		Explain the principle of operation of single phase to single phase step-up midpoint cycloconverter	12M
4		Draw and explain bridge type cycloconverter for discontinuous conduction mode.	12M
5		Explain the operation of single phase full wave ac voltage controller with resistive load.	12M
6		Explain about the $1 - \emptyset$ AC voltage controller with RL loads with neat diagram	12M
7	a)	What are the advantages and disadvantages of ac voltage controller?	8M
	b)	List some applications of cycloconverter?	4M
8		Describe the principle of working of single phase to single phase step up bridge cycloconverter	12M
9		Explain bidirectional triode thyristor along with its V-I characteristics.	12M
10		A single phase half wave ac voltage controller feeds a load of R=20 ohm with an input voltage of 230v, 50Hz. Firing angle of thyristor is 45^0. Determine a) rms value of output voltage b) power delivered to load and input pf and c) average input current.	12M

UNIT-V

CHOPPERS AND INVERTERS

1	a)	Describe the principle of chopper operation.	6M
	b)	List out various control strategies for chopper.	6M
2	a)	Write a short note on various PWM techniques	8M
	b)	List some advantages and disadvantages of PWM techniques?	4M
3		What is a chopper? List various types of chopper configurations and Explain four quadrant chopper in detail.	12M
4		With the help of basic power circuit diagram and waveform, explain the working of a step-up chopper.	12M
5		Describe the working of single phase full bridge inverter with neat waveforms.	12M
6		Draw and explain about step-down chopper and drive expression for output voltage.	12M
7	a)	What is series inverter? Explain it with neat circuit diagram.	8M
	b)	What are the applications of inverters?	4M
8		Describe different types of pulse width modulation techniques (PWM) inverter.	12M
9		Explain the single phase half bridge voltage source inverter with necessary waveforms.	12M
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 a) average and rms values of output voltage b) chopper efficiency	8M
	b)	List some applications of dc chopper?	4M