

University of Mumbai

Program: Electronics Engineering

Curriculum Scheme: Rev 2016

Examination: BE Semester VII

Course Code: ELX702

Course Name: Power Electronics

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The DIAC can be represented by
Option A:	two SCRs in anti-parallel
Option B:	two SCRs in parallel
Option C:	two diodes in anti-parallel
Option D:	two diodes in parallel
2.	The TRIAC can be represented by
Option A:	two SCRs in anti-parallel
Option B:	two SCRs in parallel
Option C:	two diodes in anti-parallel
Option D:	two diodes in parallel
3.	The TRIAC's terminals are
Option A:	gate, anode, cathode
Option B:	MT1, MT2, gate
Option C:	gate1, gate2, anode, cathode
Option D:	MT1, MT2, gate1, gate2
4.	A power transistor is a
Option A:	three layer, three junction device
Option B:	three layer, two junction device
Option C:	two layer, one junction device
Option D:	four layer, three junction device
5.	Choose the correct statement
Option A:	MOSFET is a uncontrolled device
Option B:	MOSFET is a voltage controlled device
Option C:	MOSFET is a current controlled device
Option D:	MOSFET is a temperature controlled device
6.	A thyristor (SCR) is a
Option A:	P-N-P device
Option B:	N-P-N device
Option C:	P-N-P-N device
Option D:	P-N device

7.	In the SCR structure the gate terminal is located
Option A:	near the anode terminal
Option B:	near the cathode terminal
Option C:	in between the anode & cathode terminal
Option D:	none of the mentioned
8.	A thyristor can be brought from the forward conduction mode to forward blocking mode by
Option A:	the dv/dt triggering method
Option B:	applying a negative gate signal
Option C:	applying a positive gate signal
Option D:	applying a reverse voltage across anode-cathode terminals
9.	For the SCR to remain in the ON (conducting) state
Option A:	gate signal is continuously required
Option B:	no continuous gate signal is required
Option C:	no forward anode-cathode voltage is required
Option D:	negative gate signal is continuously required
10.	The average output voltage of single phase half-wave is maximum when SCR is triggered at $\omega t =$
Option A:	π
Option B:	0
Option C:	$\pi/2$
Option D:	$\pi/4$

Q2	Solve any Four out of Six	5 marks each
A	Describe different modes of operation of SCR with the help its static V-I characteristics and explain what is holding current and latching current.	
B	Explain single phase full-bridge inverter with R load.	
C	Explain with the help of neat circuit diagram and waveforms what the effect of freewheeling diode is on the performance of single phase half wave controlled rectifier with RL load.	
D	What are turn on methods of SCR? What are the basic requirements for successful turn on of SCR? Which is the best method of SCR triggering explain why?	
E	Describe the principle of on-off control and phase control.	
F	Write a short note on Single phase cyclo-converter	

Q3.	Solve any Two Questions out of Three	10 marks each
A	Draw the schematic of step-up and step-down choppers and derive an expression for output voltage in terms of duty cycle for a step-up and stepdown chopper.	

B	Discuss the effect of source inductance on the performance of single phase fully controlled converter, indicating clearly the conduction of various thyristors during one cycle.
C	Draw and explain the basic series inverter circuit employing class A type commutation. Draw and discuss the important waveforms. State the limitations of this series inverter.

Q4.	Solve any Two Questions out of Three 10 marks each
A	Draw ramp and pedestal trigger circuit used for single phase semi converter. Describe its operation with appropriate waveforms
B	A single phase fully controlled bridge converter supplies an inductive load. Assuming that the output current is virtually constant and is equal to I_d , determine the following performance measures, if the supply voltage is equal to 230 V and if the firing angle is maintained at $(\pi/6)$ radians. (i) Average output voltage (ii) Supply RMS current (iii) Supply fundamental RMS current (iv) Fundamental power factor (v) Supply power factor (vi) Supply harmonic factor (vii) Voltage ripple factor
C	Write a short note on i) Battery charging systems ii) Static characteristics of IGBT