

2006 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS
POWER ELECTRONICS
 (ELECTRICAL & ELECTRONIC ENGINEERING)

NOVEMBER 2006

TIME - 3 HOUR
 MARK - 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain the necessity of snubber circuit for SCR and give its operation.
 (b) Derive the expressions for snubber circuit parameters connected for SCR. [8+8]
2. (a) Describe the operation of a single phase two pulse mid point converter with relevant waveforms. Derive an expression for average output voltage. [10]
 (b) A single phase fully controlled bridge converter is supplied at 230V, 50Hz, with source inductance of 2mH. Neglecting resistance voltage drop, when the converter is operating at a firing angle of 45° and the load current is constant at 10A. Determine also the load voltage. [6]
3. (a) Explain the operation of a 3-phase fully controlled rectifier with suitable waveforms of voltages and currents and a circuit diagram.
 (b) A three-phase full wave controlled rectifier is operated from a three-phase Y connected 230V, 50Hz supply and the load resistance is $10\ \Omega$. If it is required to obtain an average output voltage of 50% of the maximum possible output voltage, calculate the delay angle. If the leakage inductance of each phase of the input transformer is 2mH, calculate the overlap angle and the drop in the DC output voltage. [6+10]
4. (a) Derive the expressions for the Power dissipated in the load, for a single phase AC voltage controller feeding Resistive-inductive load for discontinuous operation of current.
 (b) Explain the operation of the above circuit for continuous current conditions. [8+8]
5. Explain the working of single phase bridge type cycloconverter with RL load for
 (a) Continuous conduction and for
 (b) discontinuous conduction with the help of neat circuit diagram and relevant output waveforms. [10+6]
6. (a) What is time ratio control of chopper? Explain the operation.
 (b) A battery is charged from a constant dc source of 220V through a chopper. The dc battery

is to be charged from its internal emf of 90V to 122 V. The battery has internal resistance 1. For a constant charging current of 10A. Compute the range of duty cycle.

7. (a) A single-phase bridge Inverter feeds an R-L-C series load with $R=3$, $L=6\text{mH}$ & $C=15\mu\text{F}$. The output frequency is 120Hz, supply voltage being 180V. Express the output voltage in terms of Fourier series & determine,

i. RMS values of thyristor current load current.

ii. Current at the instant of commutation considering up to 7th harmonics only.

(b) What is meant by load commutation in an Inverter? Under what condition commutation can be achieved by load. [4+4+8]

8. (a) Write the SPICE model for D.C circuit representation of SCR and mention where it is used.

(b) A single-phase semi converter uses freewheeling diode. The load being $R=1.5$, $L=0.5\text{mH}$ and D.C battery of 18V. The source is 120V (RMS) at 50Hz. Draw the SPICE representation of the above circuit. Give statement to evaluate average & peak value of o/p current and thyristor current (RMS).