

III B.Tech I Semester Supplementary Examinations, May 2005
POWER ELECTRONICS
(Electrical & Electronic Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain the parallel operation of SCR's and define and derive string efficiency.
(b) Explain various protection methods for SCR.
2. (a) Describe the operation of a single phase two pulse mid point converter with relevant waveforms. Derive an expression for average output voltage.
(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.
3. A three phase fully controlled bridge converter supplies a dc voltage source of 400V having an internal resistance of 1.8 ohm. Assume highly inductive load with a constant load current of 20A. The supply RMS load voltage per phase is 230V and source inductance in each phase is 0.005H. Compute the following by ignoring the source resistance
 - (a) firing angle for an output voltage of 436V
 - (b) overlap angle
4. Explain the operation of single phase A.C. voltage controller with Resistive and Resistive-inductive loads with the help of neat circuit diagram and output voltage and current waveforms. Also sketch the transfer characteristics.
5. (a) What is cycloconverter? What are its limitations?
(b) Compare the operational features of single phase midpoint and bridge type cycloconverter for R-L loads, with neat circuit diagrams and waveforms.
6. (a) Describe the operation of class E commutation circuit with appropriate waveforms.
(b) For a class D commutation circuit $V_s=230\text{V}$, $L=20\mu\text{H}$ and $C=40\mu\text{F}$. For a constant load current of 120 A calculate the circuit turnoff times for main and auxiliary thyristors.
7. (a) A single-phase bridge Inverter feeds an R-L-C series load with $R=3\Omega$, $L=6\text{mH}$ & $C=15\mu\text{F}$. 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.
8. (a) What is PSPICE? Describe the features of the same and mention its applications
- (b) How a thyristor is modeled in SPICE for A.C circuit operation draw its model circuit and represent its sub circuit .

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