2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

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

/NAVEMBER_2005

TIME: 3 HOURS
MAX MARKS: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain the operation of series connected and parallel connected SCRs with neat circuit diagrams and their characteristics. [6]

(b) Derive the static equalizing and dynamic equalizing circuit parameters with respect to series operation of SCR. [10]

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 450 and the load current is constant at 10A. Determine also the load voltage. [6]

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 [6+10]

4. (a) Explain different modes of operation of TRIAC with neat schematic diagram.

(b) Give few applications of TRIAC. [12+4]

5. (a) What is cycloconverter? What are its limitations? [6]

(b) Compare the operational features of single phase midpoint and bridge type cycloconverter for R-L loads, with neat circuit diagrams and waveforms. [10]

6. (a) Explain the need of commutation in thyristor circuits. What are the different methods of commutation schemes? Explain class A commutation with neat diagrams. [10]

(b) A circuit employing parallel resonance turn off (Class B commutation) circuit has C=50μF

L=20 μH V=200V and initial voltage across the capacitor is 200V. Determine the circuit turnoff time for main thyristor for load R=1.5   [6]

7. (a) A single-phase bridge Inverter feeds an R-L-C series load with R=3 , L=6mH & C=15μF. 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) What is PSPICE? Describe the features of the same and mention its applications   [8]

(b) How a thyristor is modeled in SPICE for A.C circuit operation draw its model circuit and represent its sub circuit .   [8]