| **Paper Code: MTED-102** | **Roll No.** | | | | | | | | | |
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**M.Tech**
**FIRST SEMESTER EXAMINATION, 2016-17**
**POWER CONVERTERS-I**

[Time: 3 Hours] [Max. Marks: 100]

**Note**-Attempt any **FIVE** questions of the following. All questions carry equal marks.

**1.** (a) Explain the different modes of operation of SCR with the relevant characteristics. **[10]**

(b) What are the different types of commutation methods employed in SCR. Draw the circuit diagram and waveforms for resonant pulse commutation. **[10]**

**2.** (a) What are static and dynamic equalizing circuits in SCR? Why these circuits required? Calculate no. of SCRs required in parallel and series operation for 1200 KV, 1000A current if the available SCR rating is 300V, 200A for series and parallel derating factor of 15%. **[10]**

(b) Draw and explain snubber circuit for dv/dt protection of SCR.
A class B commutation circuit is connected to 100V dc supply. The load resistance is 20Ω &$t_q$ of SCR is 50 µs (i) Design suitable values of commutating components (ii) calculate how long the SCR will conduct after applying the gate pulse**.** **[10]**

**3.** (a) Describe the working of 3 phase B-6 converter for firing angle $\alpha=\pi/3$. Derive the expression for average output voltage. Draw the relevant waveforms. **[10]**

(b) State the effect of source inductance and load inductance on the output voltage and current of rectifier.
A 1 phase full converter feeds power to RLE load with R=6Ω, L=6mH, E=60V. Source voltage is 230V for continuous conduction. Find the average value of load current for firing angle of 45°. In case of one of 4 SCRs gets open circuited find new value of load current. **[10]**

**4.** (a) What is the difference between semi-converter and half wave converter? **[5]**

(b) What is dc chopper? Explain the principle of operation of a step-up chopper. **[5]**

(c) A step up chopper has input voltage of 220V and output voltage of 660V. If the non-conducting time is 100 µsec, compute the pulse width of output voltage. **[10]**

**5.** Explain the operation of 3 phase bridge inverter for 180° mode of operation with relevant phase and line voltage diagrams. How it is different from 120° mode operation? **[20]**

**6.** (a) Explain 1 phase to 1 phase step down cyclo-converter with voltage and current waveforms. **[10]**

(b)What is the need for controlling the voltage at the output terminal of an inverter? Describe briefly and compare the various methods employed for the control of output voltage of inverter. **[10]**

**7.** Write short notes on any **four** parts of the following:- **[5x4= 20]**

(a) Dual converters
(b) Power MOSFET
(c) VI characteristics of IGBT
(d) Dynamic characteristics of SCR
(e) Latching and Holding current
(f) Series inverter