MEE-103

RollNo. | | | | | | | | | | |

M.Tech

(SEM I) ODD SEMESTER THEORY EXAMINATION, 2015-16

POWER CONVERTER (MEE-103)

Time: 3 Hours *Maximum Marks:100*

***NOTE**-Attempt any **FIVE**questionsof the following. All questions carry equal marks.*

Q.1. **a)** Explain Turn ON and Turn OFF mechanism of thyristor? Draw and explain two transistor model of SCR. **[10]**

b) What are the different types of commutation methods employed in SCR. Compare class C and D commutation with neat circuit diagram and waveform. **[10]**

Q.2. **a)** What are static and dynamic equalizing circuits in SCR? In a series parallel connection of SCRs the voltage and current rating of a circuit are 3kV & 750A. SCRs with a rating of 800V & 175A are available. The recommended minimum derating factor is 15%. Calculate.

i. No. of series and parallel units required.

ii. R and C required for equalization if the maximum forward leakage current of SCR is 10mA and Q=20 μc. **[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]**

Q.3. **a)**Describe the working of 3 phase half wave controlled 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]**

Q.4. **a)** Write down the working principle of step down chopper and explain its types in details. **[10]**

b) For type-A chopper, dc source voltage=230 V. load resistance=10 Ω. Take a voltage drop of 2 V across chopper when it is on. For a duty cycle of 0.4, calculate

i. average and rms values of output voltage

ii. Chopper efficiency. **[10]**

Q.5. **a)**Explain the operation of 3 phase bridge inverter for 120° mode of operation with relevant phase and line voltage diagrams. **[10]**

b) What is pulse width modulation? How these techniques control the output voltage of the inverters?

A single phase full bridge inverter has rms value of fundamental component of output voltage, with single-pulse modulation, equal to 110V. Compute the pulse width required and the rms value of output voltage in case dc source voltage is 220V. **[10]**

Q.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]**

Q.7. Explain why AC voltage controller is used? Classify and explain any one method in AC voltage controlled with relevant waveforms. Also derive the expression of rms value of output voltage. **[20]**