Roll No.....

National Institute of Technology Delhi

End Semester Examinations May 2017

Name of Specialization: Electrical & Electronics Engg Year: Third Semester: VI

Course Name: Power Electronics **Maximum Marks – 50**

Course Code: EE-352 **Total Time: 3:00 Hours**

Note:

- All Questions are compulsory.
- Do not write irrelevant theory and draw neat waveforms and circuit diagrams.
- Assume data where ever required.
- Questions are to be attempted in a proper sequence otherwise it will not be evaluated.

Section A (*01 mark each and all parts are compulsory*)

Q1) Find out CF for single phase half wave rectifier. (1)

Q2) Draw the circuit diagram of single-phase capacitor-commutated CSI with R load. (1)

Q3) Draw the circuit symbol of IGBT & MOSFET. Mark their terminals. (1)

Q4) Define dual converters and draw its equivalent circuit. (1)

Q5) Write down the disadvantages of multiphase chopper. (1)

Q6) Define harmonic reduction by stepped -wave inverters. (1)

Q7) Define latching and holding current. (1)

Q8) Explain CDF. How does VRF related to FF. (1)

Q9) Draw the circuit diagram of two-phase chopper. (1)

Q10) How much is TUF value for single phase half wave rectifier. (1)

Section B (*Any four (04) are to be attempted*)

Q11) Explain the various mechanisms by which thyristors can be triggered into conduction. (5)

Q12) Explain the operation of single-phase to single-phase step down Cycloconverter for RL load. Discuss its voltage and current waveforms. Assume the discontinuous load current. (5)

Q13) Describe the working of single-phase half bridge inverter. What is its main drawback? Explain how this drawback is overcome. (5)

Q14) Discuss the effect of source inductance with the help of typical voltage and current waveforms on the performance of a single-phase full converter indicating clearly the conduction of various thyristors during one cycle. (5)

Q15) In the continuous conduction mode of type-A chopper, show that per unit ripple in the load current is maximum when the duty cycle is equal to half. (5)

Section C (*Any two (02) are to be attempted*)

Q16) (a) A type-A chopper operating at 2kHz from a 100 V dc source has a load time constant of 6 ms and load resistance of 10Ω. Find the mean load current and the magnitude of current ripple for a mean load voltage of 50V. Also, calculate the minimum and maximum values of load current. (5)

(b) What is TRC in dc choppers? Explain the use of TRC for controlling the output voltage in choppers. How does it different from current limit control? (5)

Q17) (a) Discuss the principle of working of a three-phase bridge inverter with an appropriate circuit diagram. Draw and explain phase and line voltage waveforms on the assumption that each thyristor conducts for 120^0 . The sequence of firing of various SCRs should also be indicated in the diagram. (5)

(b) What is CSI. Discuss the working of single-phase CSI with ideal switches with the help of power circuit diagram and the waveforms for input current, output current, output voltage and input voltage. (5)

Q18)(a) A single-phase voltage controller has input voltage of 230 V, 50 Hz and a load of R = 15Ω. For 6 cycles on and 4 cycles off, determine (a) rms output voltage, (b) input pf and (c) average and rms thyristor currents. (4)

(b) What are the advantages of multistage over two-stage sequence control? Describe multistage sequence control of voltage controllers. Write down the advantages and disadvantages of two-stage sequence control over 1-phase full wave ac voltage controller. (6)