

14 July, 2018 (E)

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## National Institute of Technology Delhi

### Make Up Examinations

Name of Specialization: Electrical & Electronics Engg

Year: Third

Semester: VI

Course Name: Power Electronics

Maximum Marks – 50

Course Code: EEB-351

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.

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

- Q1) Define step up cycloconverter. (1)
- Q2) In type-A chopper, per unit ripple in the load current is maximum when the duty cycle is equal to.... (1)
- Q3) Draw the circuit diagram of single phase dual converter. (1)
- Q4) Draw the basic structure of Thyristor. (1)
- Q5) Draw the symbol of IGBT and MOSFET. (1)
- Q6) Define converter. (1)
- Q7) Draw the block diagram of a typical power electronic system. (1)
- Q8) Make a list of uncontrolled and controlled switches. (1)
- Q9) What do you mean by THD for an inverter system. (1)
- Q10) Define latching current (1)

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

- Q11) What is current limit control? How does it differ from TRC? Which of these control strategies is preferred over the other and why? (5)
- Q12) Describe the working of two-stage sequence control of voltage controllers for R load with the help of output voltage and current waveforms. (5)
- Q13) A single-phase symmetrical semiconverter is connected to RL load. Discuss its working. Illustrate your answer with waveforms of source voltage, output voltage, output current, thyristor current, source current & voltage across thyristor. (5)
- Q14) Discuss the two-transistor model of a thyristor. Derive an expression for the anode current. (5)
- Q15) Discuss the various types of power electronics converters. (5)

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

Q16) A single-phase full bridge inverter may be connected to a load consisting of (i)  $R$  (ii)  $RL$  (iii)  $RLC$  overdamped (iv)  $RLC$  underdamped. For all these loads, draw the load current waveforms under steady operating conditions. Discuss the nature of these waveforms. (10)

Q17) 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  $120^\circ$ . The sequence of firing of various SCRs should also be indicated in the diagram. (10)

Q18) Sketch switching characteristics of a thyristor during its turn-on and turn-off processes. Show the variation of voltage across the thyristor and current through it during these two dynamic processes. Indicate clearly the various intervals into which turn-on and turn-off times can be subdivided. Discuss briefly the nature of these curves. (10)