Reg. No. : | | | | | | | | | | |

Question Paper Code: 45604

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

Fifth Semester

Instrumentation and Control Engineering

14UIC504 - POWER ELECTRONICS AND APPLICATIONS

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Among the following power devices, which one is a voltage controlled device and used for high frequency switching.

   (a) BJI (b) IGBT (c) SCR (d) MOSFET

2. The Semiconductor device which is suitable for induction hardening in radio frequency range is

   (a) MCT (b) BJT (c) IGBT (d) MOSFET

3. Reactive loading of supply lines by a converter is directly dependent on

   (a) Displacement angle only (b) Displacement angle and distortion factor
   (c) Back emf in the load circuit (d) Circuit configuration

4. A Converter which can operate in both 3-pulse and 6-pulse modes is a

   (a) 1-phase full converter (b) 3-phase half-wave converter
   (c) 3-phase semi converter (d) 3-phase full converter

5. A Chopper can be used on

   (a) Pulse-Width modulation only (b) Frequency modulation only
   (c) Amplitude modulation only (d) Both PWM and FM

6. A step – up chopper has V_s as the source voltage and α as the duty cycle. The output voltage for this chopper is given by

(a) Vs (1 + α) (b) Vs / (1 - α)
(c) Vs (1 - α) (d) Vs / (1 + α)

7. In Single-Pulse modulation of PWM inverters, third harmonic can be eliminated if pulse width is equal to

(a) 30^0 (b) 60^0 (c) 120^0 (d) 150^0

8. A Single phase CSI has capacitor C as the load. For a constant source current, the voltage across the capacitor is

(a) Square Wave (b) Triangular Wave
(c) Step Function (d) Pulsed Wave

9. Matrix converter is _____ stage converter.

(a) Single (b) Two (c) Multiple (d) Three

10. The Cyclo converters (CCs) require natural of forced commutation as under

(a) Natural Commutation in both step – up and Step – down CCs
(b) Forced Commutation in both step – up and Step – down CCs
(c) Forced Commutation in both step – up CCs
(d) Forced Commutation in both step – down CCs

PART - B (5 x 2 = 10 Marks)

11. What is a Snubber Circuit?

12. Define phase angle control.

13. What is meant by step-up and step-down chopper?

14. What are the applications of an inverter?

15. What is meant by Cyclo-converter and its types?

PART - C (5 x 16 = 80 Marks)

16. (a) Draw and explain the switching characteristics of MOSFET with neat diagrams. (16)

Or

(b) Describe the working of an IGBT. How does latch – up occur in an IGBT. (16)

17. (a) Describe the working of single phase fully controlled bridge converter in the rectifying mode and inversion mode. Also sketch the following waveforms for delay angle α load voltage, load current and thyristor voltage. (16)

Or

(b) Explain the operation of dual converter with a neat circuit diagram. (16)

18. (a) Explain the current limit control and time ration control as applied to dc chopper. (16)

Or

(b) Discuss the operation of DC – DC Buck Boost converter with its waveform and derive the peak to peak ripple induction current and capacitor voltage. (16)

19. (a) Discuss the principle of working of a three-phase bridge inverter with an appropriate circuit diagram. Draw phase and line voltage waveforms on the assumption that each thyristor conducts for 180^0 and the resistive load is star connected. The sequence of firing of various SCRs should also be indicated in the diagram. (16)

Or

(b) Describe a single phase CSI connected to load R with the help of its power circuit diagram and waveforms for gating signals, load current, capacitor voltage and current, input voltage and voltage across one thyristor. (16)

20. (a) Describe the working of a multistage sequence control of voltage controllers. (16)

Or

(b) Explain the operation of single phase step-up cycloconverter with suitable waveforms. (16)

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