KUMARAGURU
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B.E. DEGREE EXAMINATIONS: NOV/DEC 2014

(Regulation 2009)

Fifth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING
EEE108: Power Electronics

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The reverse blocking voltage of power semiconductor switches depend on

    a) p-region   b) n^+-region

    c) Drift region   d) n^- region

2. The semiconductor switch used for HVDC transmission system is

    a) MOSFET   b) BJT

    c) SCR   d) TRIAC

3. For continuous conduction, in a single-phase half controlled converter each pair of SCRs conducts for

    a) $(\Pi-\alpha)$ radians   b) α radians

    c) Π radians   d) $(\Pi+\alpha)$ radians

4. If 'f' is the supply frequency, the pulse frequency of three phase full converter is

    a) 3f   b) 2f

    c) f   d) 6f

5. In DC choppers, the waveforms for input and output voltages are respectively

    a) discontinuous, continuous   b) continuous, discontinuous

    c) both continuous   d) both discontinuous

6.   A step-up chopper has Vs as the source voltage and α as the duty cycle. The out-

put voltage for this chopper is given by

a) Vs(1 +α)

b) Vs(1 -α)

c) Vs/ (1-α)

d) Vs/(1 +α)

7. A current source inverter is normally employed when

a) source inductance is large and load inductance is small

b) source inductance is small and load inductance is small

c) both source and load inductance are small

d) both source and load inductances are large

8. The Sinusoidal pulse width modulation eliminates

a) All the lower order harmonics

b) All the higher order harmonics

c) All the even harmonics

d) All the odd harmonics

9. The sequence control of AC voltage controller is employed for

a) Improvement of system power factor and reduction of harmonics in the source current

b) Improvement of system power factor only

c) Reduction of harmonics in the source current only

d) Improvement of system power factor and increase of harmonics in the load current

10. Cyclo converter converts

a) ac voltage to dc voltage

b) dc voltage to dc voltage

c) ac voltage to ac voltage at same frequency

d) ac voltage at supply frequency to ac voltage at load frequency

PART B (10 x 2 = 20 Marks)

11. What are the main differences between BJT and IGBT?

12. Define latching and holding current of an SCR.

13. What are the effects of source inductance on the performance of AC-DC converters?

14. Name the performance parameters of phase controlled converters.

15. Define the term duty cycle of DC chopper.

16. What is switching mode regulator? Mention its types.

17. What are the methods for harmonic reductions in inverters?

18. List any two applications of current source inverter.

19. What are the types of AC voltage controllers?

20. What is the type of commutation step up cyclo converter?

PART C (5 x 14 = 70 Marks)

21. a) (i) Explain the structure and operation of IGBT. (7)

       (ii) Draw and explain the static characteristic curve of SCR. (7)

(OR)

   b) (i) Describe the construction of TRIAC and explain its four modes of operation with diagrams and characteristics. (8)

       (ii) Explain the driver circuit for MOSFET. (6)

22. a) Explain using a diagram and waveforms the working of single-phase fully controlled converter with RL load and derive an expression for its average and rms output voltages.

(OR)

   b) Explain the operation of single phase dual converter with circuit and output waveforms. Also derive an expression for circulating current.

23. a) (i) Explain the control strategies of DC chopper. (7)

       (ii) Explain the principle operation of step down chopper with circuit and output waveforms. (7)

(OR)

   b) Describe briefly the principle of operation of boost converter with a neat sketch and waveforms.

24. a) Explain the principle of operation of three-phase inverter operating in 180° conduction modes with necessary waveforms. Also obtain the expression for rms value of output voltage

(OR)

   b) (i) With a neat circuit and relevant waveforms discuss the operation of single phase full bridge voltage source inverter. (7)

       (ii) Explain the Sinusoidal PWM in detail (7)

25. a) (i) With help of circuit diagram and waveform explain the operation of single-phase bidirectional voltage controller (7)

(ii) A single phase full wave ac voltage controller has a resistive load of (7)
R=10Ω and the input voltage is 120V, 60Hz. The delay angles of
thyristors are 90°. Determine (i) rms output voltage (ii) average current of thyristor and (iii) rms current of thyristor

(OR)

b) With neat circuit diagram and waveform, explain the operation of
three phase to single phase cyclo converter

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