

EX-504

B. E. (Fifth Semester) EXAMINATION, Dec., 2011

(Electrical and Electronics Engg. Branch)

POWER ELECTRONICS DEVICES AND CIRCUITS

(EX-504)

*Time : Three Hours*

*Maximum Marks : 100*

*Minimum Pass Marks : 35*

Note : Attempt total five questions. One question from each unit.

Unit - I

1. (i) Discuss the various circuits used to protect the thyristor. 10
- (ii) What are the various methods of turn on thyristor ? Explain. 10

Or

2. (i) Draw the equivalent circuit of GTO with its symbol and cross-section. Also explain its turn on and turn off process. 10
- (ii) Explain the transistor equivalent circuit of thyristor. 10

Unit - II

3. (i) With a neat diagram explain the working of a 1- $\phi$  full wave fully controlled bridge converter and also draw the waveform of output voltage, output current and voltage across the thyristor for RL load assuming the O/P current to be continuous. 10

P. T. O.

- (ii) A 3- $\phi$  three-pulse converter is operated from 3- $\phi$ , 230 V, 50 Hz supply with load resistance  $R = 10 \Omega$ . An average output voltage of 50% of the maximum possible output voltage is required. Determine : 10
- the firing angle
  - average and r. m. s. value of load current
  - rectification efficiency

Or

4. (i) Draw the power circuit diagram of 3-phase fully controlled converter. Show the output voltage waveform for firing angle  $\alpha = 30^\circ$ ,  $\alpha = 60^\circ$  and  $\alpha = 150^\circ$  for resistive load. 12
- (ii) Explain the use of flywheel diode in converters with necessary output voltage waveform. 8

## Unit-III

5. What is a three-phase inverter ? With neat circuit diagram of 3- $\phi$  bridge inverter explain the principle of operation for  $120^\circ$  mode of conduction. 20

Or

6. (i) Discuss how sinusoidal pulse width modulation works and mention what is meant by multiple pulse width modulation. 10
- (ii) Explain the principle of operation of McMurray bed ford inverters. 10

## Unit-IV

7. (i) Explain the operating principle of both stepup and stepdown choppers. 10
- (ii) With a neat sketch explain the working principle of type B and type C choppers. 10

Or

8. Draw the circuit diagram for a current commutated chopper. Explain the working of this chopper with relevant waveforms. 20

## Unit-V

9. (i) For a single-phase voltage controller feeding a resistive load, draw the waveform of source voltage, gating signal output voltage, source and output current and voltage across one SCR. Describe its working with reference to the waveform drawn. 10
- (ii) Explain the working of ideal dual converter with suitable circuit diagram and waveforms. 10

Or

10. (i) What is the difference between Dual converters with circulating current and Dual converters without circulating current ? 10
- (ii) Explain the working principle of operation of single-phase to single-phase bridge type cycloconverter. 10

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