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T 3256

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Fourth Semester

Mechatronics Engineering

EE 1263 — POWER ELECTRONICS

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define latching current in thyristors.

2. List out the drawbacks of GTO as compared to conventional thyristors.

3. Mention how thyristors in phase controlled converters are commutated.

4. Compare the output voltage (V_0) Vs firing angle (α) curve of single phase semi and full converters.

5. Mention some applications of a dc chopper.

6. What is a load commutated chopper?

7. What is the main drawback of 180° mode operation of VSI? How is it overcome in 120° mode?

8. State any 2 advantages of current source inverters over voltage source inverters?

9. What is sequence control in ac voltage controllers?

10. What do you mean by power factor in ac circuits?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the principle of working of SCR. Draw its 2 transistors equivalent and derive the expression for anode current. (16)

Or

(b) Discuss in detail about thyristor protection circuits. (16)

12. (a) Discuss the effect of source inductance on the performance of single phase full converter. Draw output voltage, load current and current through thyristor waveforms. Derive an expression for the average output voltage. (16)

Or

(b) A single phase full converter is supplied from 230 V, 50 Hz source. The load consists of $R = 25\,\Omega$ and large inductance so as to render the load current constant. For a firing angle delay of 60° determine

(i) Average output voltage

(ii) Average output current

(iii) Average and rms values of thyristor currents

(iv) Power factor. (16)

13. (a) Explain the working of current commutated chopper with the aid of circuit diagram and necessary waveforms. (16)

Or

(b) (i) List out the various forced commutation techniques. (4)

(ii) Explain complementary commutation technique with the aid of circuit diagram and relevant waveforms. (12)

14. (a) Explain the 180° mode of operation of three phase voltage source inverter. Draw the necessary equilvalent circuits to obtain the phase and line voltages. Draw the phase and line voltage waveforms for one full cycle of 360°. (16)

Or

(b) Give a short note on :

(i) PWM inverters (8)

(ii) Series inverters. (8)

15. (a) Draw the circuit diagram and explain the operation of single phase to single phase step-down cyclo converter with voltage and current waveforms for continuous load current. (16)

Or

(b) (i) Describe the working of 2-stage sequence control of voltage controllers. (10)

(ii) Discuss about the gating signal requirement of single phase ac voltage controller. (6)
