Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 20460

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Fifth Semester

Electrical and Electronics Engineering

EE 6503 — POWER ELECTRONICS

(Common to Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Mechatronics Engineering)

(Regulations 2013)

(Also common to PTEE 6503 — Power Electronics for B.E. (Part-Time) Fourth Semester – Electrical and Electronics Engineering – Regulations 2014)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How is $\dfrac{di}{dt}$ and $\dfrac{dv}{dt}$ protection provided in SCR?

2. Mention the merits and demerits of GTO.

3. Why is the power factor of semi converters better than that of full converters?

4. What is the cause of circulating current in dual converters?

5. What are the advantages and disadvantages of a resonant pulse chopper?

6. A step up chopper is operated with a duty ratio of 0.6 for a dc input of 100 V. Determine the output voltage for a load resistance of $R_L = 5$ ohm.

7. What are the purposes of feedback diodes in inverters?

8. What are the main differences between voltage-source and current-source inverters?

9. Mention merits and demerits of AC voltage controller.

10. What is a cycloconverter?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the various types of turn ON methods of SCR. (8)

    (ii) Explain the design procedure of snubber circuit. (5)

Or

    (b) Explain the steady state and switching characteristics of MOSFET with aid of diagrams.

12. (a) Explain the operation of a single phase full converter with RLE load using relevant waveforms. Obtain the expressions for its average output voltage and RMS value of output voltage. (13)

Or

    (b) Explain the operation of single phase dual converter with aid of relevant waveforms. Obtain the expression of its instantaneous circulating current. (13)

13. (a) Draw the diagram of voltage commutated chopper and explain its operation with different mode diagrams and relevant waveforms. (13)

Or

    (b) With a neat power circuit diagram, explain the operation of boost converter. Draw the load voltage and load current waveforms and derive the expression for the output voltage. (13)

14. (a) Describe the principle of operation of three phase inverter operating in 120° conduction mode with necessary diagrams. (13)

Or

    (b) Explain the principle of operation of 3-φ auto sequentially commutated CSI with power circuit. Draw the equivalent circuits and relevant waveforms. (13)

15. (a) Describe the basic principle of working of single-phase to single-phase step down cycloconverter for both continuous and discontinuous conduction. (13)

Or

    (b) Draw the circuit diagram of single phase A.C. voltage controller with RL load. Explain the circuit operation with necessary waveforms. (13)

PART C — (1 × 15 = 15 marks)

16. (a) The full-wave three-phase controlled rectifier has a three-phase 415 V, 50 Hz source (240 V phase), and provides a 100 A constant load current. Determine :

    (i) The average and rms thyristor current.

    (ii) The rms and fundamental line current.

    (iii) The fundamental apparent power. (15)

Or

    (b) For Type A step down chopper of dc source voltage = 230 V, load resistance = 10 ohm. Take a voltage drop of 2 V across chopper when it is on. For a duty cycle of 0.4, calculate (i) average and rms values of output voltage and (ii) chopper efficiency. (15)