

B.Tech III Year I Semester (R15) Regular Examinations November/December 2017

POWER ELECTRONICS

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- (a) Distinguish between SCR and TRIAC.
 - (b) List the various turnoff methods of SCR.
 - (c) A single phase full converter is connected to RLE load. The source voltage is 230 V, 50 Hz supply. The average load current of 10 A is continuous over the working range. Determine the firing angle α , when the load resistance is 0.4Ω , load inductance is 2mH and $E = -120 \text{ V}$.
 - (d) What are the drawbacks of circulating current mode of operation of Dual converter?
 - (e) For a DC-DC buck converter, dc source voltage is 230 V, load resistance is 10Ω . For a duty cycle of 0.4, calculate the average output voltage.
 - (f) How do you operate the Buck-Boost regulators in buck mode and boost mode?
 - (g) Why series inverters are called so?
 - (h) Mention the advantages of using PWM techniques.
 - (i) Write down the expression for rms load voltage and power factor of single phase AC voltage controller.
 - (j) What is a cycloconverter?

PART – B(Answer all five units, $5 \times 10 = 50$ Marks)**UNIT – I**

- 2 With the help of a two transistor model of SCR, explain its regenerative action. Also derive the expression for anode current of SCR in terms of current gains of transistor.

OR

- 3 Explain in detail the series operation of SCR. Also discuss the necessity of using static and dynamic equalizing circuits.

UNIT – II

- 4 Discuss in detail the effect of source inductance in single phase full converter.

OR

- 5 With a neat power circuit diagram and waveform, explain the working of single phase fully controlled rectifier under continuous conduction mode. Also derive the expression for its average and RMS output voltage. From the average output voltage expression, draw its control characteristics.

UNIT – III

- 6 With a neat power circuit diagram, explain the working of Boost regulator. Draw the necessary waveforms to explain its operation. Derive the expression for its output voltage.

OR

- 7 For a step down chopper circuit, source voltage $V_s = 220 \text{ V}$, chopping period $T = 2000 \mu\text{s}$, on period $T_{\text{on}} = 600 \mu\text{s}$, load circuit parameters: $R = 1 \Omega$, $L = 5 \text{ mH}$ and $E = 24 \text{ V}$.
- (i) Find whether load current is continuous or not.
 - (ii) Calculate the value of average output current.
 - (iii) Calculate the maximum and minimum values of steady state output current.
 - (iv) Calculate the average value of supply current.

Contd. in page 2

UNIT – IV

8 With a neat power circuit diagram, explain the working of full bridge voltage source inverter. Draw its output voltage waveform.

OR

9 Draw neatly the power circuit diagram of three phase inverter with star connected load. Explain the circuit operation in the 180° mode with necessary equivalent circuits. Mark the ON duration of various switches and draw all the three phase output voltages.

UNIT – V

10 With neat circuit diagram and waveforms, explain the working of single phase to single phase step down cycloconverter.

OR

11 With neat circuit diagram and waveforms, explain the working of single phase AC voltage controller.

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