D 70578

Name.....

Reg. No.....

FIRST SEMESTER M.TECH. DEGREE EXAMINATION, JANUARY 2015

EPD/EPE 10 103—ANALYSIS OF POWER ELECTRONIC CIRCUITS—I

Time : Three Hours Maximum : 100 Marks

Module 1

1. (i) Write short notes on thyristor protection. (10 marks)

   (ii) Draw the two transistor model of SCR and derive an expression for anode current. (10 marks)

2. Draw the circuit diagram and explain the working of UJT based firing circuit with a typical design. (20 marks)

Module 2

3. Describe in detail the operation of dual converter with and without circulating current modes. (20 marks)

4. (a) A step down DC chopper has input voltage of 230 V with 10 Ω load resistor connected, voltage drop across chopper is 2 V when it is ON. For a duty cycle of 0.5, calculate :

   (i) Average and r.m.s. value of output voltage.

   (ii) Power delivered to the load. (8 marks)

   (b) Explain the operation of voltage commutated chopper. (12 marks)

Module 3

5. Describe the basic principle of working of single-phase to single-phase cycloconverter with relevant waveforms. (20 marks)

6. (a) Enumerate the principle of operation of TSC. (10 marks)

   (b) For a single-phase voltage controller feeding a resistive load, show that power factor is given by the expression $\left[\frac{1}{\pi}\left\{(\pi - \alpha) + \frac{1}{2}\sin 2\alpha\right\}\right]^{1/2}$ (10 marks)

Module 4

7. Explain the operation of 3-ϕ bridge inverter for 120° degree mode of operation with aid of relevant phase and line voltage waveforms. (20 marks)

8. (i) Compare single pulse, multiple pulse and SPWM techniques in terms of harmonic spectrum, dead band, THD and switching losses. (10 marks)

   (ii) Compare VSI and CSI. (10 marks)

[5 × 20 = 100 marks]