

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2499

Roll No.

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B.Tech.

(SEM. VI) EVEN THEORY EXAMINATION 2012-13

POWER ELECTRONICS

Time : 3 Hours

Total Marks : 100

Note :- (1) Attempt all questions.

(2) All questions carry equal marks.

1. Attempt any **four** parts of following : (5×4=20)

- (a) Explain the significance of latching and holding currents.
- (b) Explain the switching characteristics of an IGBT.
- (c) List specifications of power electronic switch.
- (d) Name the different power electronic converters available and list their advantages over conventional modes of conversion and control.
- (e) Discuss the functions of diodes in antiparallel with thyristor in the inverter circuits.
- (f) In a power circuit 4 SCRs are to be connected in series. Permissible difference in blocking voltage is 20V for a maximum difference in their blocking currents of 10 mA. Difference in recovery charge is 10 μ c. Design suitable equalizer circuit.

2. Attempt any **two** parts of following : (10×2=20)

- (a) What is a dc chopper ? Describe the various types of chopper configuration with neat and appropriate diagrams.
- (b) Discuss the two transistor model of a thyristor. Using this model, describe the various mechanisms of turning-on a thyristor.
- (c) Describe the principle of giving angle control for a 1- ϕ ac voltage controller, for a resistive load. Show that its power factor is given by

$$\left[\frac{1}{\pi} \left\{ (\pi - \alpha) + \frac{1}{2} \sin 2\alpha \right\} \right]^{\frac{1}{2}}$$

3. Attempt any **two** parts of the following : (10×2=20)

- (a) Discuss the working of 1- ϕ full wave ac-dc converter taking into account the effect of source inductance. Draw the output waveform for firing angle of 30°.
- (b) For a single phase one pulse controlled converter system sketch waveform for load voltage and load currents for :
 - (i) RL load
 - (ii) RLE load with free wheeling diode across RL.
- (c) A 1- ϕ voltage controller has input voltage of 240 V, 50 Hz and a load of $R = 15 \Omega$. For 6 cycles on and 4 cycles off. Determine :
 - (i) rms output voltage
 - (ii) Input power factor
 - (iii) Average and rms thyristor currents.

4. Attempt any **two** of the following : (10×2=20)

- (a) What do you understand by dual converters ? Explain the operation of a 3- ϕ dual converter using circulating current mode of operation. How are firing angles of two converters controlled ?
- (b) Describe the basic principle of working of 1- ϕ to 1- ϕ step down cycle converter for both continuous and discontinuous conduction. Mark the conduction of various thyristor also.
- (c) A 1- ϕ half bridge inverter has a resistive load of 20 Ω and dc input voltage is 210 V. Determine the rms output voltage at fundamental frequency, output power THD distortion factor and harmonic factor.

5. Attempt any **two** of the following : (10×2=20)

- (a) Discuss the working principle of a 1- ϕ series inverter. What are the advantages and disadvantages of series-inverter.
- (b) Explain operation of a 3- ϕ bridge inverter employing 120° mode of operation. Draw waveforms of phase voltages and any one line voltage assuming star-connected resistance load.
- (c) What is pulse width modulation ? Explain sinusoidal pulse width modulation used in P.W.M. inverters. What are the advantages of P.W.M. inverters ?