

15602

Roll No. \_\_\_\_\_

Total No of Pages: 4

**15602**

**M. Tech. I - Sem. (Main) Exam., Dec. - 2018**

**Power System**

**1MPS2 Advanced Power Electronics**

**Time: 3 Hours**

**Maximum Marks: 100**

**Min. Passing Marks: 33**

*Instructions to Candidates:*

*Attempt any five questions, Marks of questions are indicated against each question. Draw neat and comprehensive sketches wherever necessary to clearly illustrate your answer. Assume missing data suitable if any and specify the same. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL

2. NIL

Q.1 (a) For a single phase one-pulse controlled converter system, sketch waveforms for load voltage and load voltage and load current for (i) RL load and (ii) RL load with freewheeling diode across RL. From a comparison of these waveforms, discuss the advantages of using a freewheeling diode. [10]

(b) Discuss the effect of source inductance on the performance of a single phase full converter indicating clearly the conduction of various thyristors during one cycle. Derive expression for its output voltage in terms of (i) Maximum voltage  $V_m$ , firing angle  $\alpha$  and overlap angle (ii)  $V_m$ ,  $\alpha$ ,  $L_s$  and load current  $I_o$ . Here  $L_s$  is the source inductance. [10]

**OR**

Q.1 A 3 phase full converter thyristor bridge feeds a resistive load R. [20]

(a) Sketch the voltage waveforms for  $V_{ab}$ ,  $V_{bc}$ ,  $V_{ac}$  etc.

(b) From (a), sketch the waveforms of the output current  $i_o$  for a firing angle of  $30^\circ$ .

Q.2 (a) In the continuous conduction mode of type A chopper, show that per unit ripple in the load current is maximum when duty cycle is equal to 0.5. [10]

(b) Write voltage equations governing the performance of type A chopper during  $T_{on}$  and  $T_{off}$  periods for RLE type load. Hence obtain therefrom expressions for the maximum and minimum current taken by the load on the assumption of continuous output current. [10]

**OR**

Q.2 Draw the power circuit diagram of a current commutated chopper. Explain the working of this chopper by dividing its commutation process interval into some well defined modes. Show distinctly the total turn off time, turn off times for main and auxiliary thyristors in the relevant waveforms drawn. [20]

Q.3 (a) What is pulse width modulation? List the various PWM techniques. How do these differ from each other? [10]

(b) Explain sinusoidal pulse modulation as used in PWM inverters. Discuss the conditions under which the number of pulses generated per half cycle are  $\frac{f_c}{2f}$  or  $\left(\frac{f_c-1}{2f}\right)$ . Here  $f_c$  and  $f$  are the frequencies of carrier and reference signals respectively. [10]

**OR**

Q.3 For harmonic reduction in single phase inverters, two identical transformers are used in series. If their rectangular output voltage waveforms are shifted from each other by  $120^\circ$ , then sketch these voltage waveforms and their resultant waveform on the assumption that transformer secondary opposes each other. Find also an expression for the net output voltage as a function of time. Hence find the percentages derating of the inverter so far as its fundamental power component is concerned. [20]

Q.4 (a) Describe the principle of phase control in single phase half wave ac voltage controller. Derive an expression for the average and rms value of output voltage for this voltage controller. <http://www.mgsuonline.com> [10]

(b) For a single phase voltage controller feeding a resistive load, draw the waveforms of source voltage, gating signals, output voltage, source and output currents and voltage across one SCR. Describe its working with reference to the waveforms drawn. [10]

**OR**

Q.4 (a) A single phase full wave ac voltage controller feeds a load of  $R=20\ \Omega$  with an input voltage of 230V, 50 Hz. Firing angle for both the thyristors is  $45^\circ$ . Calculate

(i) rms value of output voltage

(iii) load power and input pf. [10]

(b) Explain the working of three phase A.C. controllers with relevant waveforms. [10]

- Q.5 Describe the working of single phase to single phase step down cycloconverter for both continuous and discontinuous conduction for a bridge type cycloconverter. Mark the conduction of various thyristors also. [20]

**OR**

- Q.5 (a) Describe how single phase low frequency output voltage can be fabricated from the segments of 3 phase input voltage waveform through the use of a 3 phase half wave circuit. Show a complete cycle of low frequency outputs voltage. [10]
- (b) Write short notes on matrix converter in detail. [10]

-----

<http://www.mgsuonline.com>

**Whatsapp @ 9300930012**

**Your old paper & get 10/-**

**पुराने पेपर्स भेजे और 10 रुपये पायें,**

**Paytm or Google Pay से**