

Time : 3 Hours

Min. Passing Marks : 24

Maximum Marks : 80

## Instruction to Candidates :

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

## Unit-I

1. (a) Explain the constructional details and working of power MOSFET. [8]  
 (b) Explain and draw the switching characteristics of the power IGBT. [8]

OR

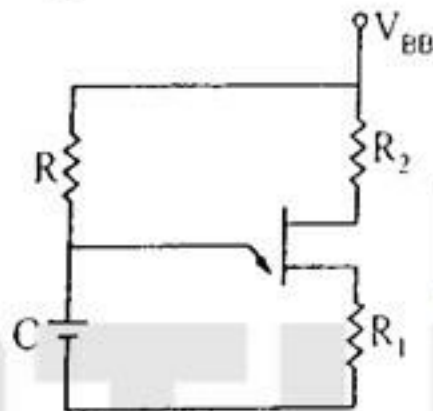
1. (a) Discuss the two transistor model of a thyristor. [8]  
 (b) Describe the various commutation of thyristor. [8]

## Unit-II

2. (a) Explain how SCR is protected against high  $dv/dt$ . [8]  
 (b) Explain various turning on methods of a thyristor. [8]

OR

2. (a) Explain series operation of thyristor. [8]  
 (b) In a UJT triggering oscillator as shown in figure,  $R = 6.8 \text{ kW}$  and  $C = 0.1 \mu\text{F}$ . If  $\eta = 0.82$ , calculate the frequency of oscillation of relaxation oscillator.



[8]

## Unit-III

3. (a) Describe working of a single phase full converter with RL load through the waveform of supply voltage, load voltage, load current and voltage across thyristor. Also, derive expression for load voltage & input power factor. [10]  
 (b) A single phase half wave controlled converter is operated from a 120V, 50Hz supply. Load resistance  $R = 10 \text{ ohms}$ . If average output voltage is 25% of the maximum possible average output voltage, determine:  
 (i) Firing angle  
 (ii) RMS & Average output current. [6]

OR

3. (a) Explain principle of operation of single-phase dual converter without circulating current in detail. [8]  
 (b) A single-phase dual converter is operated from a 200 V, 50 Hz supply and the load resistance is  $R = 20 \text{ ohms}$ . The circulating inductance is  $L_r = 50 \text{ mH}$ , delay angle are  $\alpha_1 = 50^\circ$  and  $\alpha_2 = 130^\circ$ . Calculate the peak circulating current and the peak current of converter. [8]

## Unit-IV

4. (a) Explain the extinction angle control technique of power factor improvement along with the circuit diagram and waveform. [8]  
 (b) Describe the working of a single phase semi-converter with RLE load, through the wave form of supply voltage, load voltage load current and voltage across thyristor and also, derive expression for load voltage and input power factor. [8]

OR

4. (a) Explain pulse with modulation control technique of power factor improvement along with circuit diagram and waveform. [8]  
 (b) A single-phase full converter is supplied from 200 V, 50 HZ source. If load resistance  $R = 8 \text{ ohms}$  and source has an inductance of 1.5 mH, for a firing angle delay of  $60^\circ$ , determine:  
 (i) Average output voltage  
 (ii) The angle of overlap. [8]

## Unit-V

5. (a) Explain working principle of type-C chopper along with relevant circuit diagram & waveform. [8]  
 (b) Explain the load commutated chopper along with relevant circuit diagram & waveform. [8]

OR

5. (a) Describe the working of Buck-Boost regulator along with circuit diagram & waveform. [8]  
 (b) Derive the expressions for steady-state maximum & minimum current for type-A chopper. [8]