

**17444****21415****3 Hours / 100 Marks****Seat No.**

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- Instructions :** (1) All Questions are *compulsory*.  
 (2) Illustrate your answers with neat sketches wherever necessary.  
 (3) Figures to the right indicate full marks.  
 (4) Assume suitable data, if necessary.  
 (5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.  
 (6) Preferably, write the answers in sequential order.

**Marks****1. (A) Answer any SIX :****12**

- Define Holding Current and Latching Current for SCR.
- List four regions in characteristics of power transistor.
- Draw two transistor equivalent circuit of SCR & label it.
- Define : (1) Chopper (2) Inverter
- Define commutation. What is meaning of natural commutation ?
- List two applications of choppers.
- State advantages of controlled rectifier over uncontrolled rectifier.
- What is function of timer ?

**(B) Answer any TWO :****08**

- Explain how DC voltage is varied in single phase half wave controlled rectifier with resistive load.
- Give classification of choppers on the basis of input, output voltage levels and directions of output voltage current.
- It is desirable in a LDR based application in industry to change intensity of light falling on it. Suggest a electronic circuit and explain its working with appropriate circuit diagram.

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**2. Answer any FOUR :****16**

- (a) Draw single phase controlled bridge rectifier with R-L load and explain its working. Draw i/p, o/p voltage & current waveforms.
- (b) Explain operation of step-down chopper with waveforms for output voltage and current.
- (c) Compare ON line and OFF line UPS w.r.t. following points :
  - (1) Nature of output
  - (2) Transfer time
  - (3) Condition of mains static switch
  - (4) Condition of UPS static switch
- (d) Draw symbol of TRIAC. It can be operated in how many mode ? Which mode is most sensitive ?
- (e) Explain operation of class-C commutation with neat sketch and o/p load voltage & current waveforms.
- (f) Draw circuit diagram of step-up chopper. Explain its working with i/p & o/p voltage waveforms.

**3. Answer any FOUR :****16**

- (a) Draw symbol and characteristics of DIAC, SUS.
- (b) Draw circuit diagram of three phase half wave controlled rectifier circuit with o/p voltage waveform.
- (c) Draw symbol of SCR. Draw its Static V-I characteristics. Name various regions on it.
- (d) Using UJT relaxation oscillator circuit how SCR can be fired ? Draw circuit & o/p pulses, capacitor voltage waveform.
- (e) Draw half-wave controlled rectifier (R-L) load with free-wheeling diode. Explain the effect of freewheeling diode on the circuit with o/p voltage waveform.
- (f) Sketch circuit of three phase uncontrolled half wave rectifier (Resistive load). Draw its i/p and output waveforms.

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**4. Answer any FOUR :****16**

- (a) What is need of Inverter ? List four applications of Inverters.
- (b) Explain constructional details of PUT. Why it is called programmable ?
- (c) With help of appropriate circuit diagram explain working of battery charging regulator.
- (d) Compare linear regulator with S.M.P.S. on the basis of
  - (1) Efficiency
  - (2) Power dissipation
  - (3) Ripple
  - (4) Heat sink
- (e) It is required to fire SCR from  $0$  to  $\pi$  in sinusoidal input. Suggest a firing circuit. Explain it with neat circuit diagram.
- (f) Draw circuit diagram of single phase half bridge inverter. Explain its working with o/p voltage waveform.

**5. Answer any FOUR :****16**

- (a) With the help of block diagram explain principle of ON LINE UPS.
- (b) Draw symbol of SCS. Draw its constructional details. How SCS is turned ON and turned OFF ?
- (c) Explain working of centre tapped full wave controlled rectifier (R load) with neat circuit diagram & i/p-o/p voltage & current waveforms.
- (d) With neat circuit diagram, explain how pulse transformer is used for firing SCR.
- (e) Draw constructional diagram of n-channel IGBT. Draw its symbol. List its applications.
- (f) Compare three phase uncontrolled and controlled rectifier (Resistive load) (any four points).

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**6. Answer any FOUR :****16**

- (a) Write function of :
- (1) Switching element
  - (2) Catch diode
  - (3) L-C filter
  - (4) Comparator in S.M.P.S.
- (b) A single phase half wave rectifier is used to supply power to load impedance  $10 \Omega$  from  $230 \text{ V } 50 \text{ Hz}$  A.C. supply at firing angle  $30^\circ$ . Calculate average load voltage.
- (c) Compare natural and forced commutation w.r.t. need of external commutating components, types of supply, cost of commutation circuit, power dissipation.
- (d) Define following parameters for G.T.O.
- (1) maximum gate to cathode reverse voltage
  - (2) maximum controllable anode current.
- (e) List four applications of power MOSFET. Why thermal run away does not take place in power MOSFET ?
- (f) Draw the circuit of class A commutation for SCR & describe its operation.
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