

313335

24225

3 Hours / 70 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.

**Marks**

**1. Attempt any FIVE of the following :**

**10**

- (a) State the advantages of power electronics.
- (b) Draw the symbol of SCR and TRIAC.
- (c) Define Triggering. List the types of triggering.
- (d) Compare controlled and uncontrolled rectifiers.
- (e) Explain the terms related to Chopper :
  - (i) Turn on period ( $T_{On}$ )
  - (ii) Turn off period ( $T_{Off}$ )
- (f) Define a photovoltaic (PV) cell.
- (g) Compare Step up and Step down chopper.

**2. Attempt any THREE of the following :**

**12**

- (a) Describe with neat sketch construction of IGBT.



- (b) Explain with neat circuit diagram overcurrent protection (Internal and external over voltages).
- (c) Explain with neat circuit diagram the operation of  $1\phi$  half wave controlled rectifier with RL load.
- (d) Explain  $dv/dt$  triggering methods for SCR turn ON.

**3. Attempt any THREE of the following :**

**12**

- (a) Explain the load commutation class A method with neat circuit diagram.
- (b) Explain the concept of voltage source inverter with circuit diagram.
- (c) Explain the operation of RC firing circuit with neat circuit diagram.
- (d) Draw and explain the  $3\phi$  full wave controlled bridge rectifier with R load. Draw its waveforms.

**4. Attempt any THREE of the following :**

**12**

- (a) Explain with waveform working principle of sinusoidal pulse width modulation.
- (b) Explain with neat circuit diagram operation of  $1\phi$  full wave controlled bridge rectifier with R load.
- (c) Explain variable frequency control strategy of a chopper along with output waveform.
- (d) Draw the block diagram and explain the operation of a wind power generation system.
- (e) Draw the block diagram and explain the operation of AC to AC converter using DC link.

**5. Attempt any TWO of the following :****12**

- (a) Draw and explain V-I characteristics of SCR. Define the terms :
  - (i) Latching current
  - (ii) Holding current
- (b) For a class F commutation, answer the following :
  - (i) Explain operation with circuit diagram.
  - (ii) Interpret with waveforms
- (c) Justify with sketches the effect of freewheeling diode in a fully controlled rectifier with RL load.

**6. Attempt any TWO of the following :****12**

- (a) Draw the symbol and labelled V-I characteristics of following :
    - (i) Power MOSFET
    - (ii) TRIAC
    - (iii) IGBT
  - (b) Describe with neat circuit diagram and waveform of  $1\phi$  full wave bridge inverter with R load.
  - (c) Describe working of step down chopper with neat circuit diagram and waveforms. Also write equation for output voltage.
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