[Total Marks : 80

N.B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **three** questions out of remaining **five** question.
(3) **Figures** to the **right** indicate **full** marks.

1. (a) Draw and explain V-I characteristics of SCR. 5
   (b) What is the need of frewheeling diode in controlled rectifier. Explain with example. 5
   (c) What do you understand by $\frac{di}{dt}$ and $\frac{dv}{dt}$ rating of SCR. 5
   (d) Explain the principle step down clopper. State load voltage equation. 5

2. (a) Explain half controlled rectifier using SCR. Draw waveforms and derive the relation for output load voltage. 10
   (b) Draw and explain single phase full bridge inverter. Draw waveforms. 10

3. (a) Single phase half bridge invertor has a resistive load of 3Ω and the dc input voltage E_{dc} = 50 V. Calculate
   (i) RMS output voltage at the fundamental frequency
   (ii) Output power P_0
   (iii) The average and peak current of each thyristor.
   (iv) The peak reverse blocking voltage of each thyristor.

4. (a) Explain the working of single phase to single phase cycloconverter with purely resistive load. Draw circuit diagram and waveforms. 10
   (b) The input voltage to the buck-boost convertor is E_{dc} = 14V. The duty cycle a = 0.6 and the switching frequency is 25 KHz. The inductance L = 180 μH and filter capacitance C = 220 μH. The average load current Io = 1.5 A. calculate 10
   (a) The average o/p voltage E_0
   (b) The peak-to-peak output voltage ripplea ΔV_C
   (c) The peak-to-peak current of inductor Δ I
   (d) The peak current of the device Ip

5. (a) Explain circuit diagram and working of three phase inverter 180⁰ conduction mode with resistive load. 10
   (b) Diffrentiate between symmetrical and asymmetrical IGBT. 5
   (c) Draw and explain switching characteristics of IGBT. 5

6. (a) Explain the voltage control technique in inverter using sinusoidal pwm method. Justify the use of it reduces harmonics. 10
   (b) Draw and explain dual convertor with all four quadrants of operation. 5
   (c) Define forced communication. Explain Class D communication with respect to circuit diagram, working and waveforms. 5