Duration:3hrs **Marks:80**

Note:- 1. Question No. 1 is compulsory
2. Attempt any **three** questions out of remaining **five** questions
3. Assume suitable data if necessary & justify the same

1	Attempt **any four**.	
(i)	Compare single phase half bridge and full bridge inverter	5
(ii)	Explain briefly the need of driver circuits for MOSFET/IGBT.	5
(iii)	Illustrate the protection circuit of SCR. How do you protect an SCR from overcurrent and overvoltage?	5
(iv)	Illustrate the circuit diagram of a single phase PWM rectifier and mention its advantages.	5
(v)	Compare Silicon Carbide and Gallium Nitride devices.	5
2 (A)	With the help of two transistor analogy, describe the principle of operation of SCR.	10
(B)	Explain any one type of single phase cyclo converter.	10
3 (A)	With a neat diagram of 3Φ bridge inverter feeding a star connected resistive load, explain the operation for 120^0 conduction mode. Sketch all phase voltages.	10
(B)	Explain conduction and switching losses in a semiconductor device.	10
4	Draw a three phase fully controlled rectifier (full converter) connected to a resistive load, the gating pulse sequence and explain briefly. (i) Draw the input and output voltage waveforms for a firing angle of α=60°. (ii) Derive the average output voltage in terms of α for a purely resistive load.	20
5 (A)	Explain Sinusoidal Pulse width modulation (SPWM) technique. What is the main advantage of Space Vector Modulation (SVM) as compared to SPWM?	10
(B)	Compare power BJT and IGBT	10
6(A)	Illustrate the diagram and the output voltage waveforms of a controlled rectifier suitable for four quadrant operation. What are its applications?	10
(B)	Illustrate the diagram of Buck dc to dc converter and derive the voltage ratio. Buck converter has an input voltage of V_d= 14V.The required average output voltage is V_o=6V, R_L= 200Ω and peak to peak ripple voltage is 20mV.The switching frequency is 25kHz. If the peak to peak ripple current in inductor is limited to 0.8A, determine(i) duty cycle of switch and (ii) value of inductor.	10