Duration – 3 Hours   **Total 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**.	
(A)	With the help of two transistor analogy of SCR, briefly explain why gate loses its control once SCR is turned ON?	5
(B)	Mention any two applications of dc to dc converter. Draw the diagram of a Buck dc to dc converter and draw the inductor voltage, inductor current and derive the voltage ratio.	5
(C)	What are the advantages of PWM rectifier as compared to controlled rectifier using SCR? What are its applications? Illustrate the diagram of a single phase PWM rectifier.	5
(D)	Illustrate the diagram of a single-phase half bridge inverter and draw the output voltage waveform for square wave mode of operation. Such an inverter is connected to a resistive load of 2.4 Ω with d.c. input voltage of 24V each. Determine: (i) RMS output voltage (ii) Output power and (iii) Peak blocking voltage of each switch.	5
(E)	Compare Silicon Carbide and Gallium Nitride devices.	5
2 (A)	Explain any two commutation methods of SCR.	10
(B)	Describe any one application of Triac-Diac circuit. Derive the expression for RMS value of output voltage and draw the following waveforms: (i) Supply voltage; (ii) load voltage; (iii)Voltage across Triac.	10
3 (A)	Explain the operation of 3Φ bridge inverter feeding a resistive load for 180^0 conduction mode. Draw the pulse sequence for the switches & sketch all phase voltages and any one line to line voltage waveform.	10
(B)	What is the need for a Snubber circuit? Explain any one snubber circuit.	10
4 (A)	Draw the diagram of a Boost converter and derive its voltage ratio. In Boost converter, V_d=12V, R_L=24Ω, L=1mH, f_s=10kHz and the output voltage required is twice than that of input. Find (i) duty cycle; (ii) the peak to peak inductor current ripple and (iii)average input current. Assume lossless converter.	10
(B)	Give a comparison between MOSFET and IGBT (any five points). Why driver circuit is needed to drive MOSFET & IGBT? Suggest any suitable driver circuit.	10
5	Draw a three phase half controlled rectifier (semi controlled) and the gating pulse sequence and explain briefly. (i) Draw the input and output voltage waveforms for a firing angle of α=0° and α=30°. (ii) Derive the average output voltage in terms of α for a purely resistive load. (iii) Find the numerical value of output voltage and current for a firing angle of 30°, if this converter is fed from a 440V, 3Φ, 50Hz supply and is feeding a resistive load of 12 ohms. Graph sheet will be provided.	20
6(A)	With neat diagrams explain the operation of AC voltage controller feeding R-L load.	10
(B)	Explain any two pulse width modulation technique of inverter.	10

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