

**Total Marks: 80**

**Duration: 3 Hrs.**

- N.B.: - (1) Question No.1 is compulsory.  
(2) Attempt any three questions from Q2. to Q6.  
(3) Assume suitable data if necessary and justify the same.  
(4) Figures to right indicate full marks

- Q.1 Answer **ANY FOUR** questions.
- a) Discuss the significance of  $di/dt$  and  $dv/dt$  in SCRs [5]
  - b) Explain the p-n layered structure of power diode and draw the VI characteristics for power and signal diode. [5]
  - c) Compare single phase half wave controlled and uncontrolled rectifiers with R-load. [5]
  - d) What is Pulse Width Modulation? Explain any PWM technique in brief. [5]
  - e) Write a note on Snubber Circuit. [5]
- Q.2 a) Describe R and RC firing circuits of SCR. [10]  
b) Explain 180 degrees conduction mode of 3 phase Inverter with appropriate waveforms and Voltage equations. [10]
- Q.3 a) Explain the operation of Power IGBT and its Turn ON and Turn OFF characteristics. [10]  
b) Explain the role of heat sinks in Power Electronics. [10]
- Q.4 a) Draw and explain the operation of a fully controlled bridge rectifier with RL load and derive the expression for average and RMS values of DC output voltage. [10]  
b) Explain the control of Output Voltage of Buck Boost Regulator by controlling the Duty Cycle. [10]
- Q.5 a) What is the commutation process in SCR? give its different types and explain Complementary and natural commutation in detail [10]  
b) A step up chopper has an input voltage of 220 V and output voltage of 660 V. If the conduction time of Thyristor chopper is 100 microsec, compute the pulse width of output voltage. [10]  
Also find the average value of output voltage if the output voltage pulse width is halved for constant frequency operation.
- Q.6 a) Explain 3-phase half wave controlled rectifier with R load with the necessary diagrams for continuous mode of conduction. Derive the expression for output voltage. [10]  
b) Explain SOA of Power Transistors. [5]  
c) Draw and explain half bridge Voltage Source Inverter with R load. Draw the output voltage and current waveforms. [5]

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