

[illegible]

1. Define the Safe Operating Area for power device.
2. Give the basic characteristics of GaN devices.
3. Define secondary breakdown in BJT.
4. Compare the BJT and Thyristor.
5. Give the significance of intelligent power modules.
6. Define the IGCT and draw its symbol.
7. List the methods for minimizing the EMI generation.
8. What is need for snubber circuits effects on switching devices.
9. Compare conduction, convection, and radiation.
10. List the parameters to be considered for proper mounting of the device with the heat sink.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the switching characteristics of power diodes and give their voltage and current waveform for forward to reverse operation of one switching device.

Or

- (b) Differentiate the static and dynamic behavior of an Ideal switch. Explain how a practical switch deviates from an ideal switch's behavior. When in parallel operation and one switch enters into short circuit.

12. (a) Explain the quasi saturation in power BJT and write notes on emitter current crowding.

Or

- (b) Explain the turn-on process of an SCR and also, discuss converter grade and inverter grade SCRs.

13. (a) Give the detailed construction and explain the device physics of power MOSFET.

Or

- (b) Describe the construction, static, and switching characteristics of IGBT with neat diagrams.

14. (a) Explain the necessity of isolation in power electronic circuits. List the advantages and disadvantages of isolation using an optocoupler and pulse transformer.

Or

- (b) With the necessary circuit diagram and waveforms, discuss the turn-on and turn-off snubber circuit for a power transistor.

15. (a) Explain the heat sink selection and cooling methods in detail.

Or

- (b) Write a short note on the thermal modeling of anyone power-switching device.

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PART C — (1 × 15 = 15 marks)

16. (a) A PIC microcontroller gives a square wave drive signal with an amplitude of 5 V at 10 kHz. It is to be applied to an IGBT switch. Draw and explain different types of driver circuits for an IGBT.

Or

- (b) The reverse saturation current densities in a PN junction diode and a Schottky diode are 10^{-11} A/cm² and 6×10^{-8} A/cm², respectively, at $T=300$ K. The cross-sectional area of the Schottky diode is $A=10^{-4}$ cm². The current in each diode is 0.80 mA. The difference in forward-bias voltages between the two diodes is 0.285 V. Determine (i) the voltage applied to each diode and (ii) the cross-sectional area of the PN junction diode.

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