| Reg. No. | | | | | | | | | | | | |
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| Question Paper Code | 12318 |
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**M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023**

First Semester

**M.E. - Power Electronics and Drives**

**20PPEPC101 - ADVANCED POWER SEMICONDUCTOR DEVICES**

(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

**PART - A (10 × 2 = 20 Marks)**

Answer ALL Questions

| | | *Marks, K-Level, CO* |
|---|---|---|
| 1. | Explain the softness factor of a diode. | *2,K2,CO1* |
| 2. | Schottky diode has no turn on transient and has little turn off transient. Interpret on this statement. | *2,K2,CO1* |
| 3. | Illustrate how the secondary breakdown is avoided in BJT. | *2,K2,CO2* |
| 4. | Interpret the preference of vertical structure type construction in power transistors. | *2,K2,CO2* |
| 5. | Explain the applications of IGBT. | *2,K2,CO3* |
| 6. | Explain the limitations of MOSFET and the need for isolation of power semiconductor devices. | *2,K2,CO3* |
| 7. | Compare BJT and MCT in terms of gate circuit. | *2,K2,CO4* |
| 8. | Interpret how the gate of a thyristor is protected against over voltage and over current. | *2,K2,CO4* |
| 9. | Explain latch-up mode of an IGBT. | *2,K2,CO5* |
| 10. | Show how the heat sink selection is made for a particular rating of a fast recovery power diode. | *2,K2,CO5* |

**PART - B (5 × 13 = 65 Marks)**

Answer ALL Questions

| | | | |
|---|---|---|---|
| 11. | a) | Explain the device selection strategy based on the power rating of the load. | *13,K2,CO1* |
| | | **OR** | |
| | b) | Demonstrate in detail the EMI impact due to switching of the power semiconductor devices. | *13,K2,CO1* |
| 12. | a) | Explain the VI characteristics of a NPN Power transistor and discuss quasi saturation effect. | *13,K2,CO2* |
| | | **OR** | |
| | b) | Explain the operation of MCT. Discuss its advantages over other devices. | *13,K2,CO2* |

13. a) Demonstrate the steady state and dynamic state models of MOSFET with suitable diagrams. *13,K2,CO3*

**OR**

b) Outline the MOSFET circuit model during cut off mode, saturation and ohmic mode of operation. *13,K2,CO3*

14. a) Explain various cooling methods used for power devices and for power converter modules in detail. *13,K2,CO4*

**OR**

b) Identify the protection method employed to protect SCR from transient and over currents. *13,K3,CO4*

15. a) Explain how to calculate the average power loss in a semiconductor switch. *13,K2,CO5*

**OR**

b) Show how the heat sink selection is made for a particular rating of a fast recovery power diode. *13,K2,CO5*

## PART - C (1 × 15 = 15 Marks)

16. a) (i) Explain how the gate gets triggered with high dv/dt. *7,K2,CO4*
(ii) Explain the features of different types of heat sink. *8,K2,CO5*

**OR**

b) (i) Explain how snubbers are designed for IGBT protection. *7,K2,CO4*
(ii) Explain the significance of intelligent power modules. *8,K2,CO5*