Register Number……

M.E. DEGREE EXAMINATIONS: DECEMBER 2009

First Semester

POWER ELECTRONICS AND DRIVES

PED502: Advanced Power Semiconductor Devices

Time: Three Hours **Maximum Marks: 100**

Answer All the Questions:-

PART A (10 x 2 = 20 Marks)

1. Draw the FBSOA and RBSOA for a MOSFET.
2. What is softness factor of a power diode?
3. What is secondary breakdown?
4. Draw the static model of a thyristor.
5. What is pinch off voltage in MOSFET?
6. What is GTO? What is the requirement to turn of GTO?
7. Why we have to give the train of pulses rather than a solid pulse to SCR's?
8. What is polarized snubber?
9. Why it is necessary to determine the junction temperature of a device?
10. What are the various thyristor mounting techniques used to connect with the heat sink?

PART B (5 x 16 = 80 Marks)

11. (a) i) Draw the characteristics of Power transistor and show the Safe Operating Area. (8)

ii) Explain the switching characteristics of a power diode. (8)

(OR)

(b) i) Give a brief comparison of major high power devices. (8)

ii) Brief about EMI produced in power electronic circuits, their sources, methods to reduce and the standards. (8)

(4)

12. (a) i) What are the difference between the converter grade and inverter grade SCR's?

ii) Explain the two transistor model of an SCR and derive the equation for the anode current. (12)

(OR)

(b) Briefly explain the construction of a BJT. Draw its static and switching characteristics.

13. (a) i) What are the various types of MOSFET? Explain them with neat diagrams. (8)

ii) Draw the steady state characteristics of MOSFET and explain the various regions of operation. (8)

(OR)

(b) Briefly explain the construction of a IGBT. Draw its static and switching characteristics.

14. (a) i) What are the basic requirements of the firing circuit in order to provide the control pulses to the power circuit? (4)

ii) With neat circuit diagram explain the UJT based firing scheme for thyristor. (12)

(OR)

(b) An unpolarized RC snubber circuit, has C = 0.75 μF, R= 6.6Ω and input voltage V_s= 220 V. the circuit inductance is L = 50 μH. Determine a) Peak forward voltage V_p, b) the initial dv/dt, and c) the maximum dv/dt.

15. (a) i) Explain how the heat transfer is taking place in a power electronic switch and how it is cooled. (8)

ii) A power device has a thermal capacity of 0.2 Jº/C and a thermal resistance of 0.7 ºC/W. Determine the maximum power dissipation the power device can withstand for 0.1 second for temperature not exceeding 40ºC. (8)

(OR)

(b) Obtain the thermal model of a power electronic switch

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