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M.TECH

Total Number of Pages :1

M.TECH 1ST SEMESTER SUPPLE EXAMINATIONS, DECEMBER 2018
ADVANCED POWER SEMICONDUCTOR DEVICES

Branch: PE, Subject Code:MPEPE1044

(Regulations 2017)

Time: 3 Hours

Max Marks : 70

Question Code: SD18002061

PART-A (10 X 2=20 Marks)

1. Answer the following questions.
 - a) Define the working principle of IGBT
 - b) Compare MOSFET and IGBT in terms of their applications
 - c) Draw the Gate driving circuit of MOSFET
 - d) What are the limitations of MOSFET? How does single electron theory overcome this limitations
 - e) Compare RCT and FCT
 - f) Draw the Gate driver circuit of BJT
 - g) What are the features of Field controlled Thyristors
 - h) Explain the term Reverse recovery time and Peak inverse current of a power diode
 - i) Compare FCT, RCT
 - j) List any two differences between controlled and un-controlled devices

PART-B (5 X 10=50 Marks)

Answer any five questions from the following.

2. a) Explain the switching characteristics of BJT [5]
- b) The parameters of a transistor switch are $V_{CC}=250V$, $V_{BE(sat)}=3V$, $I_B=8A$, $V_{CE(sat)}=2V$, $I_{CS}=100A$, $t_d=0.5\mu s$, $t_r=1\mu s$, $t_s=5\mu s$, $t_f=3\mu s$, and $f_s=10kHz$. The duty cycle is $k=50\%$. The collector-to-emitter leakage current is $I_{CEO}=3mA$. Determine the power loss due to collector current (a) during $t_{on} = t_d + t_r$, (b) during conduction period t_n , (c) during turn off $t_{off} = t_s + t_f$, (d) during off time t_o and (e) total average power losses P_T . [5]
3. a) What are the different types of power diodes? Explain [5]
- b) Explain the EMI phenomenon due to switching. What are the different methods to reduce it [5]
4. a) Explain the construction and operation of MCT [5]
- b) Explain over Voltage, over current and Gate Protection of Power BJT . [5]
5. a) Differentiate between converter grade and inverter grade SCR's [5]
- b) A thyristor is fed from a constant DC voltage of 240Volts and connected to a resistive load of $R_l=50$ ohms. The specified limits for $di/dt=60$ amp/micro sec and $dv/dt = 300v/micro$ sec. Determine the value of di/dt inductance and snubber circuit parameters. Assume damping ratio $=0.5$ [5]
6. a) Explain the two transistor transient model of a thyristor [5]
- b) Explain the switching characteristics of thyristors during turn-on and turn-off [5]
7. a) Explain the Power handling capability and Safe operating Area of Power device [5]
- b) Differentiate between Liquid Cooling and Vapour phase cooling [5]
8. Write Short notes on the following
 - a) Ideal Switch [5]
 - b) switching characteristics of IGBT [5]