Fourth Semester B.E. Degree Examination, June-July 2009 Power Electronics

Max. Marks:100

Note: Answer any FIVE full questions.

List the major types of Power Electronic circuits and mention in each case the type of input supply given and the output we get. Also mention some applications of each type. (96 Marks)

Sheeth the output characteristics of enhancement type MOSFET. What are the basic effectives in control of BJT and MOSFET?

(06 Marks)

circuit diagrams and waveforms of control signal and output voltage explain the control characteristics of SCR and MOSFET. (08 Marks)

With a neat circuit diagram explain "Antisaturation control" of BJT. Mention the improvement and drawbacks of this arrangement. (06 Marks)

With a neat diagram explain the static and switching characteristics of insulated gate bipolar transistor (IGBT). (08 Marks)

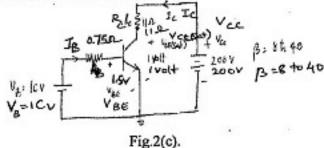
For the transistor switch shown in Fig2(c).

Calculate forced beta β_f of transistor.

 ii) If the manufacturer's specified β is in the range 8 to 40, calculate the minimum overdrive factor (ODF).

Obtain the power loss P_T of the transistor.

(06 Marks)

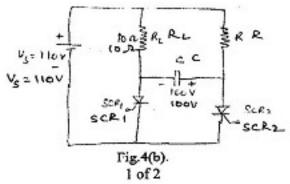


 Using two-transistor model, explain the twin-on mechanism of a SCR. Derive an expression for anode current in terms of transistor parameters. (08 Marks)

With a neat circuit diagrams and waveforms explain the working of a ramp triggering using
UJT to trigger SCR. Mention the merits and demerits of the circuit. (12 Marks)

Explain with the help of a circuit diagram and relevant waveforms the working of HRB resonant pulse commutation.

For the complementary commutation circuit shown in Fig.4(b), calculate the values of R and C for successful commutation of SCR₁. Assume that the holding current of SCR₂ is 2.5mA. (06 Marks)



- Explain briefly external pulse commutation with necessary circuit diagram and waveform.
- With the help of suitable circuit diagrams explain the operation of single phase Ac regulator 5 using phase control and ON-OFF control.
 - With the help of a neat circuit diagram and waveforms explain its operation of a bidirectional controller with resistive load. Derive the necessary equations for Vo(rms).

(08 Marks)

- In an ON-OFF control circuit using 1 o, 230 V, 50 Hz supply the ON time is 10 cycles and OFF time is 4 cycles. Calculate the RMS value of the output voltage. (04 Marks)
- Explain the working of a 1φ, fully controlled converter with inductive load with the help of a neat circuit diagrams and waveforms and hence derive the equation for the Vo(av) and (10 Marks) Vo(rms). Assume continuous conduction.
 - A 3φ half wave converter is operated from a 3φ star connected 208V, 60Hz supply and the load resistance is $R = 10\Omega$. If it is required to obtain an average output voltage of 50% of the maximum possible output voltage, calculate.
 - Delay angle i)
 - rms and average o/p currents ii)
 - Average and rms thyristor currents iii)
 - Rectification Efficiency iv)
 - v) TUF
 - Input power factor. vi)

(10 Marks)

- Explain the basic principle of a step down chopper and write down the expressions for
 - Average output voltage i)
 - Output power, and ii)
 - Effective input resistance in terms of the chopper duty cycle.

(08 Marks)

- A step up DC chopper has an input of 200 volts and an output of 250 volts. The blocking period in each cycle of operation is 0.6 x 10⁻³ seconds. Find the period of conduction in each (06 Marks) cycle. Derive the equation for Vo(av). (06 Marks)
- Briefly give the classification of choppers.

- Derive an expression for rms value of output voltage for half bridge inverter having square wave output. Assume the peak value of the output as $\frac{V_s}{s}$. (06 Marks)
 - Explain the operation of a 1φ full bridge inverter. Derive the necessary equation for rms (10 Marks) value of the output voltage. Draw the relevant waveforms.
 - c. Explain the application of an inverter in UPS.

(04 Marks)