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Printed Pages : 4 **TEE – 603**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2061 Roll No.

B. Tech.

(SEM. VI) EXAMINATION. 2007

POWER ELECTRONICS

Time : 3 Hours] *[Total Marks : 100*

*Note : Answer all the **five** questions. All questions carry **equal** marks.*

1 Answer any **four** parts of the following : **5×4=20**

(a) List specifications of a power electronic switch.

(b) List ac to dc and ac to ac power electronic converters and draw their output.

(c) Explain switching characteristics of a power transistor.

(d) Draw V-I characteristics of a GTO and explain its operation.

(e) Draw two transistor model of a SCR and explain its turn-on mechanism. Why does SCR not turn-on in reverse biased condition ?

(f) Compare power transistor, MOSFET and IGBT with reference to power switching applications.

2 Answer any two parts of the following : **10×2**

(a) For the circuit shown in fig 2(a) the operating frequency is 2 kHZ and the required dv/dt is 100V/μ sec. If the discharge current be limited to 100A, calculate

(i) the values of R_s and C_s

(ii) the power loss in the snubber.

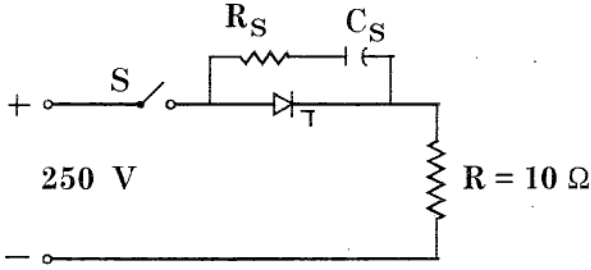

Fig. 2(a)

(b) Why does unequal voltage sharing take place among series connected thyristors during steady state and dynamic state ? How is equal voltage shaving obtained in both the states?

(c) Discuss control strategies for operation of choppers. Why is time ratio control (TRC) preferred?

In a step down chopper feeding a resistive load, the average output voltage is 109 V. The voltage drop across the chopper switch when it is ON is 2 V. If the load resistance be 10 ohm and frequency of operation be 2kHZ. For duty ratio of 0.5, calculate :

(i) dc input voltage to the chopper

(ii) the rms output voltage

(iii) chopper efficiency

(iv) input resistance of the chopper.

3 Answer any **two** parts of the following : **10×2=20**

(a) Explain operation of a single phase fully controlled bridge converter feeding a highly inductive load. Draw wave forms of output voltage, load current and source current. What happens when the source has inductance and discuss its effect on performance of the converter.

(b) Explain operation of a 3-phase half wave controlled converter feeding a highly inductive load making current continuous and draw load voltage waveform. Derive an expression for dc output voltage.

(c) Draw circuit diagram of a single phase dual converter and explain its working in continuous current mode of operation. How are the firing angles of both converters decided? Discuss the need of centre tapped inductor.

4 Answer any **two** parts of the following : **10×2=20**

(a) A single phase full wave ac regulator feeds a pure resistive load. Derive an expression for output voltage.

A single phase, 220 V, 1 KW electric room heater is connected across 220 V ac supply through a TRIAC. For a delay angle of 90° calculate the power dissipated by the heater element.

(b) Draw a circuit diagram and explain the working of static on load tap charger for transformers.

(c) Explain working of a single phase bridge type cycloconverter. Draw output voltage waveform for output frequency 50% of the input frequency for resistive load.

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5 Answer any **two** parts of the following : **10×2=20**

(a) Explain operaton of a single phase full bridge inverter. Draw waveshapes of output current when :

(i) load is pure resistive

(ii) load is pure inductive

(iii) load is R-L-C underdamped. Justify about the waveshape.

(b) Explain operation of a three phase bridge inverter employing 120° mode of operation. Draw waveforms of phase voltages and any one line voltage assuming star-connected resistance load.

(c) Explain operation of three phase current source inverter and mention its advantages over voltage source inverter. Give its applications.