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Seventh Semester B.E. Degree Examination, December 2012
Power Electronics

Time: 3 hrs.

Max. Marks:100

Note: *Answer FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1. a. What is power electronics? Give two applications of P.E. **(06 Marks)**

   b. What is the difference between thyristor and a TRIAC? **(04 Marks)**

   c. What are the peripheral effects of power electronics equipments? **(10 Marks)**

2. a. What is a bipolar transistor and explain how many types are there and what are their three region operations? **(10 Marks)**

   b. What are pinch of voltage, threshold voltage and transconductance of MOSFET? **(06 Marks)**

   c. Compare BJT, MOSFET and IGBTs. **(04 Marks)**

3. a. What is the difference between SCR and a TRIAC? Explain its characteristics? **(08 Marks)**

   b. The input voltage of Fig.Q3(b) is $V_s = 200V$ with load resistance of $R = 5\Omega$. The load and stray inductance are negligible and the thyristor is operated at a frequency of $f_s = 2$ kHz. If the required dV/dt is 100 V/µs and the discharge current is to be limited to 100 A. Determine i) the value of R_s and C_s , ii) the scrubber loss and iii) the power rating of scrubber resistor. **(08 Marks)**
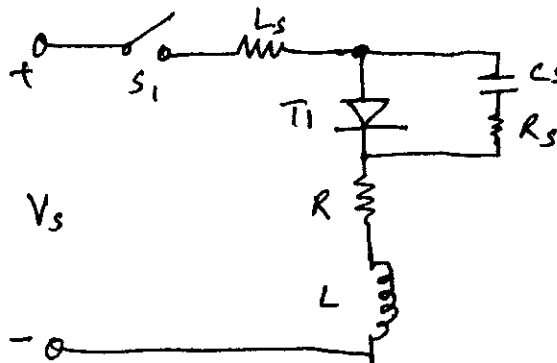

Fig.Q3(b)

   c. What is the common technique for voltage sharing and serial connected thyristor? **(04 Marks)**

4. a. With a neat diagram and waveforms, explain the principle of single phase full connectors purely resistive load. Derive the expression for voltage o/p voltage and rms o/p voltage. **(10 Marks)**

   b. What are the advantages and disadvantages of series converters? **(06 Marks)**

   c. How do you classify phase control converters? Explain. **(04 Marks)**

PART – B

5 a. Draw a circuit diagram and associated waveforms, explain the operation of a single phase bi-directional AC voltage controller with resistive load, obtain the rms output voltage.
(10 Marks)

b. An ac voltage controller in Fig.Q5(b) has a resistive load of R = 10Ω and the root-mean-square (rms) input voltage is V_s = 120V, 60 Hz. The thyristor switch is on for n = 25 cycles and is off for m = 75 cycles. Determine i) the rms output voltage V_0, ii) the input power factor (PF) and iii) the average and rms current of thyristors.
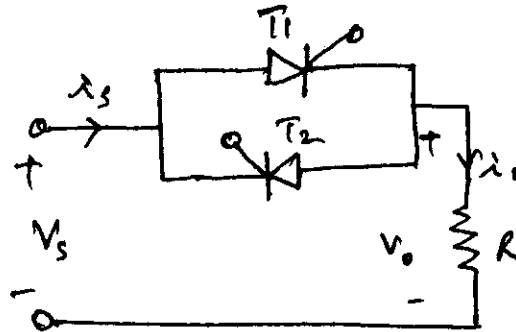**(07 Marks)**

Fig.Q5(b)

c. What are the advantages and disadvantages of ON-OFF control? **(03 Marks)**

6 a. What is an inverter? Explain its principle of operation (any one) with a neat diagram and waveforms.
(08 Marks)

b. What are the performance parameters of inverters? **(06 Marks)**

c. How to differentiate 1φ and 3φ inverters? **(06 Marks)**

7 a. What is the principle of stepdown operation of chopper? **(04 Marks)**

b. The stepdown chopper circuit shown in Fig.Q7b(i) & (ii), having resistive load. Derive an expression for the following:
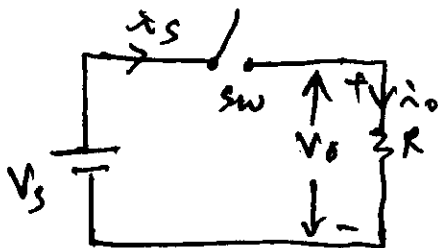i) Average output voltage $V_o(av)$ ii) rms output voltage V_o (rms).   **(08 Marks)**
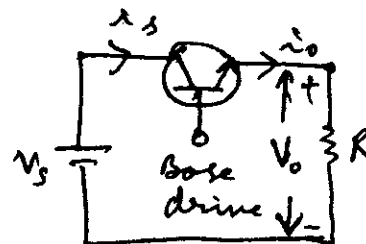

Fig.Q7b(i)

Fig.Q7b(ii)

c. A chopper circuit is operating on TRC at a frequency of 2 kHz on a 460 V supply of the load voltage of 350V. Calculate the conduction period of the thyristor in each cycle. **(08 Marks)**

8   Write short notes on :
a. Communication techniques
b. Difference between ON-OFF control and phase control
c. Static induction transistor (SIT's)
d. Performance parameters of rectifier. **(20 Marks)**

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