

CBCS SCHEME

17EC73



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Seventh Semester B.E. Degree Examination, July/August 2022 Power Electronics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- a. Draw symbols and control characteristics of the following power semiconductor devices
i) SCR ii) GTO iii) SITH iv) IGBT v) BJT. (10 Marks)
b. Explain different types of power electronics circuits and mention their applications. (10 Marks)

OR

- a. Explain the switching characteristics of power BJT with the help of its transient model. (10 Marks)
b. Explain the operation of n-channel enhancement types MOSFET with its transfer characteristics. (10 Marks)

Module-2

- a. Illustrate V-I characteristics of SCR with its different modes of operation. (10 Marks)
b. Describe turn on methods of SCR. (04 Marks)
c. Draw two transistor model of SCR and derive expression for anode current. (06 Marks)

OR

- a. Define Commutation. List the differences between Natural and Forced commutation. (06 Marks)
b. Describe the operation of SCR. Resistance firing circuit with neat circuit and waveforms. (08 Marks)
c. Explain Class – A commutation circuit with waveforms. (06 Marks)

Module-3

- a. With circuit diagram, explain single phase full converter with RL load derive equation for average output voltage and rms output voltage. (10 Marks)
b. With neat diagram and waveforms, explain the principle of phase controlled converter operation. (08 Marks)
c. What is the role of freewheeling diode in controlled rectifiers with R-L load? (02 Marks)

OR

- a. An ac voltage controller has resistance load $R = 10\Omega$ and root mean square input voltage (rms) is $V_s = 120V$, 60Hz. The thyristors switch is 'ON' for $n = 25$ cycles and is 'OFF' for $m = 75$ cycles. Calculate i) The rms output voltage V_o ii) The input power factor (PF) iii) The average and rms current of thyristors. (Refer Fig Q6(a))

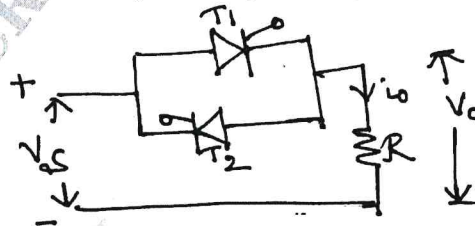


Fig Q6(a)
1 of 2

(06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- b. Explain the principle of phase control, with the help of waveforms and obtain an expression for average value of output voltage. (08 Marks)
- c. Explain the operation of a single phase bidirectional controller with resistive load and write an equation for rms output voltage. (06 Marks)

Module-4

- 7 a. The dc chopper has a resistive load $R = 10\Omega$ and the input voltage is $V_s = 220V$. When the converter switch remains 'ON' its voltage drop is $V_{ch} = 2V$ and the chopping frequency is $f = 1KHz$. If the duty cycle is 50%, calculate
- The average output voltage
 - The rms output voltage
 - The converter efficiency
 - The effective input resistance R_i of the converter
- (10 Marks)
- b. Explain the operation of step down chopper with RL load and derive an expression for peak to peak load ripple current. (10 Marks)

OR

- 8 a. With the help of circuit diagram, explain four quadrant type E chopper. (10 Marks)
- b. With the help of circuit diagram and waveforms, explain the operation of a Boost regulator. Derive the expression for peak – to – peak ripple current. (10 Marks)

Module-5

- 9 a. Explain the performance parameters of inverters. (08 Marks)
- b. Give the comparison between Current Source Inverter (CSI) and Voltage Source Inverter (VSI). (04 Marks)
- c. With circuit diagram, explain single phase bridge inverter. (08 Marks)

OR

- 10 a. Write a short notes on
- Single phase AC switches
 - Solid state Relays
- (10 Marks)
- b. Explain the working of variable dc-link inverter. (10 Marks)

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