CBCS SCHEME

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17EC73

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.***

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.

Module-1

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

2 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

3 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

4 a. Define Communication. 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

5 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

6 a. An ac voltage controller has resistance load R = 10Ω 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_0 ii) The input power factor (PF) iii) The average and rms current of thyristors. (Refer Fig Q6(a))

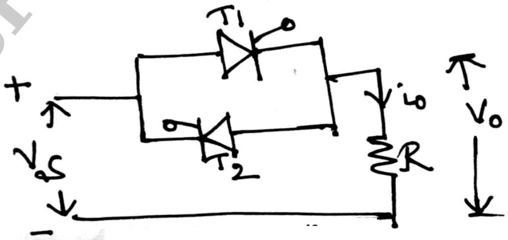

Fig Q6(a) **(06 Marks)**

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 = 10Ω and the input voltage is V_s = 220V. When the convertor switch remains 'ON' its voltage drop is V_{ch} = 2V and the chopping frequency is f = 1KHz. It the duty cycle is 50%, calculate

i) The average output voltage
ii) The rms output voltage
iii) The converter efficiency
iv) 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. Writ a short notes on

i) Single phase AC switches
ii) Solid state Relays **(10 Marks)**

b. Explain the working of variable dc-link inverter. **(10 Marks)**

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