CBCS SCHEME

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15EC73

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Power Electronics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Draw the control characteristics of the following:
i) SCR ii) GTO iii) MCT iv) IGBT **(08 Marks)**

b. What are the peripheral effects of power electronics equipment and mention how to overcome it? **(08 Marks)**

OR

2 a. Explain different types of power electronics converter circuits with input and output waveforms **(08 Marks)**

b. Explain the switching characteristics of IGBT and mention its advantages. **(08 Marks)**

Module-2

3 a. Explain two-transistor analogy of SCR. **(08 Marks)**

b. i) Explain the need for dv/dt and di/dt protection for SCR.
ii) A SCR circuit has the following data: v_s = 200v, dv/dt = 100v/μs, di/dt = 50 A/μs. Calculate the snubber circuit components. **(08 Marks)**

OR

4 a. Discuss dynamic turn-on and turn-off characteristics of SCR. **(08 Marks)**

b. With neat circuit diagram, explain the working of class-A self commutation with relevant waveforms. **(08 Marks)**

Module-3

5 a. Explain the operation of single-phase full converter with neat circuit diagram and waveform. Derive expression for average and rms output voltage. **(08 Marks)**

b. i) Explain how a dual-converter works in all four quadrants.
ii) A single phase dual converter is operated from a 120V, 50Hz supply and the load resistance R = 10Ω. The circulating inductance is L_r = 40mH. Delay angles are $\alpha_1 = 60°$ and $\alpha_2 = 120°$. Calculate the peak circulating current and the peak current of converter 1. **(08 Marks)**

OR

6 a. Explain the principles of ON-OFF control for single-phase AC voltage controller. Draw the circuit and relevant waveforms. **(08 Marks)**

b. A single phase full converter working on ON-OFF control technique has supply voltage of 230V RMS, 50Hz, load = 50Ω. The controller is ON for 30 cycles and OFF for 40 cycles. Calculate:
i) ON and OFF time intervals
ii) RMS output voltage
iii) Input pf
iv) Avg and rms thyristor currents. **(08 Marks)**

Module-4

7 a. Explain the working of step down choppers with waveforms and derive the expression for output voltage. **(08 Marks)**

b. Explain the working of boost-regulator and derive expression for average output voltage. **(08 Marks)**

OR

8 a. Explain the principle of step-up chopper. Derive expression for output voltage. **(08 Marks)**

b. I. Explain four quadrant operation of chopper.

II. Consider the switch, to be ideal in the circuit of Fig.Q.8(b), determine:

i) Duty cycle K for which $V_{0\,av} = V_{0,rms}$

ii) The chopper efficiency

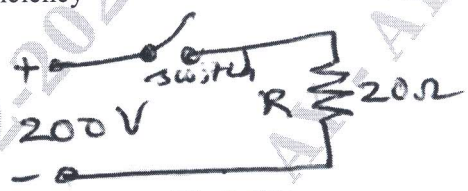

Fig.Q.8(b)

(08 Marks)

Module-5

9 a. Explain the performance parameters of inverters. **(08 Marks)**

b. i) Give comparison between voltage source inverter and current source inverter.

ii) Explain half bridge inverter with inductive load. **(08 Marks)**

OR

10 a. Explain the working of transistorized current source inverter. **(08 Marks)**

b. i) Explain with neat circuit variable dc link inverter. Mention its advantages and disadvantages.

ii) Considering a single phase bridge inverter if V_s = 200v and $V_{01(rms)}$ is 90V, determine the delay angle β. **(08 Marks)**

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