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

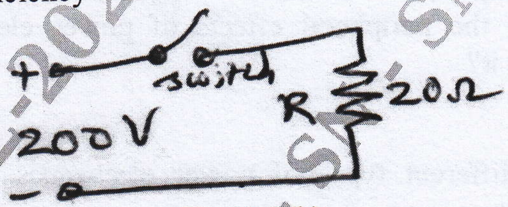

Fig.Q.8(b)

(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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