CBCS SCHEME

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15EC73

Seventh Semester B.E. Degree Examination, June/July 2024
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. Explain the control characteristics of various power devices. **(08 Marks)**

b. Explain the various types of power electronic circuits along with suitable waveforms. **(08 Marks)**

OR

2 a. Explain the construction, working and steady state characteristics of n-channel enhancement MOSFET. **(08 Marks)**

b. With the help of neat circuit diagram and relevant waveforms, explain the transient characteristics of BJT. **(08 Marks)**

Module-2

3 a. With a neat figure, explain the dynamic turn-on and turn-off characteristics of a thyristor. **(08 Marks)**

b. Derive expression for anode current using two-transistor model in case of SCR. **(08 Marks)**

OR

4 a. What is forced commutation? With the help of circuit diagram and waveform, explain the operation of class-A commutation. **(08 Marks)**

b. With neat circuit diagram and waveforms, explain RC – Half wave firing circuit. **(08 Marks)**

Module-3

5 a. With the help of neat circuit diagram, describe the operation of a single phase full converter with R.L load. Draw the associated waveforms. Derive expressions for rms and average output voltages. **(08 Marks)**

b. A single phase half wave converter is operated from 120V, 60Hz supply. If the load is resistive with R = 10Ω, and the delay angle is α = 60°, calculate efficiency, FF, TUF. Also, derive the equations for rms and average output voltages. **(08 Marks)**

OR

6 a. With neat circuit diagram and waveforms, explain the principle of phase angle control in AC voltage controller. Derive the equations for rms and average output voltages. **(08 Marks)**

b. A single phase half wave ac voltage controller has an input voltage of 150V and a load resistance of 8Ω. The firing angle of thyristor is 60° in each positive half cycle. Find :

i) Average output voltage
ii) RMS output voltage
iii) Power output
iv) Power factor (pf)
v) Average input current over one cycle. **(08 Marks)**

Module-4

7 a. Explain the working principle of step-down chopper and derive expression for :
   (i) Average output voltage
   (ii) Output power
   (iii) Effective input resistance in terms of chopper duty cycle. (08 Marks)
 b. Explain the operation of a step-up chopper with resistive load. (08 Marks)

OR

8 a. With the help of circuit diagram, explain four quadrant type E Chopper. (08 Marks)
 b. With the help of circuit diagram and waveforms, explain the working of a Buck regulator. Derive the expression for peal-peak-ripple current of the inductor. (08 Marks)

Module-5

9 a. Explain the operation of single phase full bridge inverter with relevant waveforms. (08 Marks)
 b. With the help of circuit diagram and relevant waveform, explain current source inverter. What are the advantages and disadvantages of current source inverter? (08 Marks)

OR

10 a. Explain the working of boost inverter with the help of neat circuit diagram and waveforms. Derive the expression for o/p voltage. (08 Marks)
 b. Write short notes on:
   i) Single phase AC switches
   ii) Solid state switches (08 Marks)

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