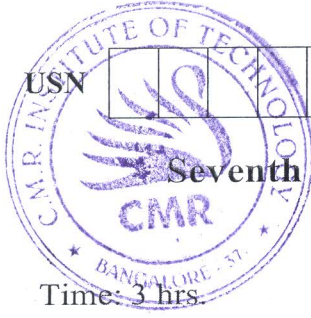


CBCS SCHEME

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 $R = 10\Omega$, and the delay angle is $\alpha = 60^\circ$, 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 peak-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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