



CBCS SCHEME

17EC73

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024 Power Electronics

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. With input and output waveform, explain different types of power electronics circuits. (08 Marks)
b. With neat steady state characteristics, explain power BJT. (06 Marks)
c. Write a control characteristics for the following power devices :
i) SCR ii) IGBT iii) GTO. (06 Marks)

OR

- 2 a. With switching model, explain the switching characteristics of MOSFET. (08 Marks)
b. What are the peripheral effects of power converters? How can be minimize them? (06 Marks)
c. With symbol and characteristics, explain the following power devices.
i) TRIAC ii) LASCR iii) MCT. (06 Marks)

Module-2

- 3 a. Explain how small gate current turns ON the SCR using two transistor models. Obtain the anode current expression interms of L_1 and L_2 . (08 Marks)
b. With neat circuit diagram and waveform explain RC half-wave firing circuit for SCR. (06 Marks)
c. Define commutation. List the difference between Natural and forced commutation. (06 Marks)

OR

- 4 a. With a neat sketch of VI characteristics, explain the regions of operation of SCR. Define holding and latching current. (08 Marks)
b. With neat circuit and necessary waveform explain class A commutation. (06 Marks)
c. Mention conditions required for turn off of SCR and explain dynamic turn off characteristics of SCR. (06 Marks)

Module-3

- 5 a. Define ACVC. With neat circuit and waveform explain the operation of full wave ACVC with resistive load. Obtain the expression for RMS vale output voltage. (08 Marks)
b. Explain the operation of ON-OFF control type ACVC. Draw waveform for ON for 3 cycles and OFF for 2 cycles. (06 Marks)
c. Discuss why short duration gate pulses are not suitable for full wave ACVC with inductive load? With example. (06 Marks)

OR

- 6 a. Explain the principle of operation 1ϕ half wave rectifier with resistive load. Obtain the expression for average value of output voltage. (08 Marks)
b. Explain the operation of semi converter with RL load (inductive). (06 Marks)
c. Explain the operation of Dual converter. (06 Marks)

Module-4

- 7 a. Explain the working step down chopper with R – load. Derive the expression for average output voltage. (08 Marks)
- b. Explain the block diagram of switch mode regulator. (06 Marks)
- c. Write a circuit diagram and waveform for step down chopper with inductive load. Mention the difference between step up and step down chopper. (06 Marks)

OR

- 8 a. Define chopper. Explain any four different types of choppers. (08 Marks)
- b. Explain step up chopper with R – load with circuit and waveform. (06 Marks)
- c. A step down DC chopper has resistive load of $R = 15\Omega$ and input voltage $V_{dc} = 200V$. When chopper remains ON, voltage drop is zero. The chopper frequency is 1KHz. If duty cycle is 50% determine :
- Average output voltage
 - RMS output voltage
 - Chopper efficiency
 - Effective input resistance of chopper. (06 Marks)

Module-5

- 9 a. Explain the operation of full Bridge inverter with R load also draw waveform for RL load. (08 Marks)
- b. Define the following with respect to inverter :
- n^{th} order Harmonic Factor ($H F_n$)
 - Total Harmonic Distortion (THD)
 - Distortion Factor (DF). (06 Marks)
- c. Explain current source inverter with circuit and waveforms. (06 Marks)

OR

- 10 a. Explain the operation of half bridge inverter with RL load (Inductive). (08 Marks)
- b. With a note on :
- Voltage control 1ϕ inverter
 - Variable DC link inverter. (06 Marks)
- c. Explain briefly AC and DC switches. (06 Marks)

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