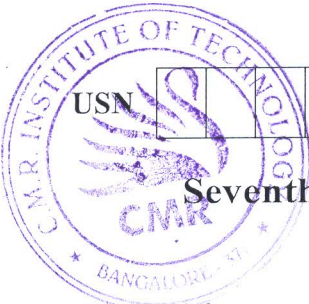


CBCS SCHEME



USN

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 : (06 Marks)
i) SCR ii) IGBT iii) GTO.

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. (06 Marks)
i) TRIAC ii) LASCR iii) MCT.

Module-2

- 3 a. Explain how small gate current turns ON the SCR using two transistor models. Obtain the anode current expression in terms 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 value 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)
