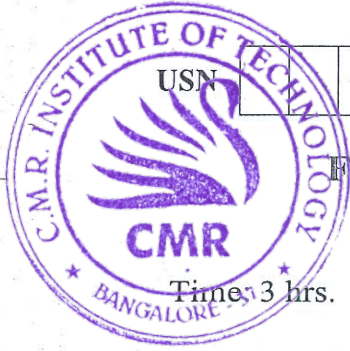


# CBCS SCHEME



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18EE53

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023  
Power Electronics

Max. Marks: 100

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

## Module-1

- List the different types of power electronic circuits and mention their conversion functions. (10 Marks)
  - Mention the various characteristics and specifications of switches. (06 Marks)
  - Explain the peripheral effects in power electronic circuits. (04 Marks)

OR

- Describe reverse recovery characteristics of diode. (08 Marks)
  - Derive the time constant of RC circuit. (08 Marks)
  - The forward voltage drop of a power diode is  $V_D = 1.2$  V at  $I_D = 300$  A, assuming  $n = 2$  and  $V_T = 25.7$  mV, find the reverse saturation current  $I_S$ . (04 Marks)

## Module-2

- Discuss the different operating regions of a power BJT. (06 Marks)
  - Describe the switching characteristics of power BJT with necessary waveforms during turn-on. (08 Marks)
  - Explain the steady state characteristics of following devices: (i) MOSFET (ii) IGBT (06 Marks)

OR

- Explain with neat circuit diagrams proportional base control and anti-saturation control. (10 Marks)
  - Explain the necessity of isolation using pulse transformer and opto-couplers. (10 Marks)

## Module-3

- Using two transistor analogy, derive an expression for anode current in a thyristor. (10 Marks)
  - Distinguish between:
    - Latching current and holding current of a thyristor
    - Converter grade and inverter grade thyristors(04 Marks)
  - Sketch the VI characteristics and then explain latching current, holding current and break over voltage. (06 Marks)

OR

- Explain the need for  $\frac{dv}{dt}$  and  $\frac{di}{dt}$  protection. (06 Marks)
  - A SCR circuit has the following data:  
supply voltage = 200 V,  $\frac{dv}{dt}$  rating =  $100 \frac{V}{\mu s}$ ,  $\frac{di}{dt}$  rating =  $50 \frac{A}{\mu s}$ ,  
calculate the snubber circuit elements. (06 Marks)
  - With a neat circuit diagram and waveforms, explain the RC triggering for SCR. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. With neat circuit and waveforms, derive an expression for the rms value of output voltage of 1- $\phi$  full wave controlled rectifier with R load. (08 Marks)
- b. For the 1- $\phi$  full converter having inductive load and continuous load current, obtain:  
(i) Average output voltage (ii) rms output voltage (06 Marks)
- c. Describe the working of 1- $\phi$  dual converter and draw the waveforms. (06 Marks)

OR

- 8 a. Derive an expression for the rms value of the output voltage of a bi-directional AC voltage controller employing ON-OFF control. (10 Marks)
- b. With necessary waveforms, derive the expression for rms output voltage of a 1- $\phi$  full wave controller with inductive load for discontinuous load current. (10 Marks)

Module-5

- 9 a. Explain the principle of operation of a step-up chopper. (06 Marks)
- b. Classify the different types of chopper circuits. (04 Marks)
- c. With the help of circuit and quadrant diagrams, explain the working of a class E chopper. (10 Marks)

OR

- 10 a. Explain the operation of single phase full bridge inverter with R load and draw the waveforms. (08 Marks)
- b. Explain sinusoidal PWM technique used for controlling the output voltage of an inverter. (05 Marks)
- c. Write a note on performance parameters for inverters. (06 Marks)

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