



CBCS SCHEME

15EC73

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Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

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. A single phase full converter is connected to a supply of $(\sqrt{2} * 120) \sin 2\pi * 50t$. The triggering angle of the SCR is 60° . The load inductance is very large. Calculate (i) DC of output voltage (ii) rms output voltage (iii) Harmonic fact (HF) (iv) Input power factor (v) rms value of fundamental component of supply current. Take the load current as 10 A. (08 Marks)
- b. A DC motor is used in an electric train. The DC motor is controlled by a power electronic circuit. It is required that the power electronic circuit should be capable of operating the DC motor in all four quadrant of operation. Draw the necessary circuit, explain its operation along with waveforms and derive the expression for DC o/p voltage. (08 Marks)

OR

- 6 a. A single phase full-wave AC voltage controller delivers an output power of 719.95 W to a load of 10Ω . The input voltage is $V_s = (169.7) \sin \omega t$. Find:
i) rms o/p voltage
ii) triggering angle α
iii) rms value of SCR current
iv) average value of SCR current
v) input power factor. (08 Marks)

- b. Draw the circuit of single phase bidirectional AC voltage controller with inductive load. Explain its operation along with relevant waveforms. Derive the expression for rms output voltage. (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. What do you mean by inverters? Explain the operation of single phase full bridge inverter. Draw the load current waveforms for R, RL and RLC loads. (08 Marks)
- b. Mention the applications of current source inverters. Explain any one type of single phase current source inverter. (08 Marks)

OR

- 10 a. Explain solid state relays. (08 Marks)

- b. Explain microelectronic relays. (08 Marks)

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