

Fundamentals of Power Electronics (313335)

MSBTE K-Scheme · Electrical Engineering (EE) · Sem III · Important Questions

Based on MSBTE papers S-2024...S-2026 available on msbte.ac.in (papers analysed: W-24, S-25, W-25, S-26). Practice guidance only — not a prediction of the exam.

Probability: **High** = asked in 3 or 4 of the 4 papers · **Medium** = asked in 2 papers · **Low** = asked once, or in syllabus but not asked yet. Questions asked in different wording are grouped together.

Paper pattern (all 4 papers): Q1 any 5 of 7 (2 M) = 10; Q2 any 3 of 4 (4 M) = 12; Q3 any 3 of 4 (4 M) = 12; Q4 any 3 of 5 (4 M) = 12; Q5 any 2 of 3 (6 M) = 12; Q6 any 2 of 3 (6 M) = 12; total 70 marks, 3 hours.

Unit 1: Power Electronic Devices (SCR, TRIAC, DIAC, Power MOSFET, IGBT)

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
V-I characteristics of SCR; define latching current and holding current (effect of gate current)	2, 6	S-26 (5a), W-25 (5a), S-25 (5a), W-24 (1a/6a)	5	High
Draw symbols of SCR, TRIAC, IGBT, power MOSFET	2	S-26 (1d), S-25 (1b), W-24 (1b)	3	High
Construction / working of IGBT (with +ve gate voltage)	4	S-26 (2a), W-25 (2a), S-25 (2a)	3	High
Advantages / need of power electronics (power electronic system)	2	W-25 (1a), S-25 (1a)	2	Medium
Applications of SCR	2	S-26 (1a), W-24 (6a)	2	Medium
Construction / working of power MOSFET (n-channel E-type, +ve gate)	4, 6	W-25 (6a), W-24 (2a)	2	Medium
Symbol and V-I characteristics of SCR / TRIAC / IGBT / power MOSFET (combined 6 M)	6	S-25 (6a), W-24 (5a)	2	Medium
Construction and V-I characteristics of TRIAC with applications	4	S-26 (3b)	1	Low
DIAC — construction, V-I characteristics, use in triggering	—	Not asked yet (standard syllabus topic)	0	Low

Unit 2: Turn-on, Turn-off (Commutation) and Protection of Thyristors

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
Turn-on (triggering) methods of SCR — define triggering, list methods	2, 4	S-26 (1g), W-25 (2c), S-25 (1c), W-24 (1c)	4	High

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
Class A (load / resonant) commutation	4	S-26 (2b), W-25 (3a), S-25 (3a), W-24 (3c)	4	High
R (resistance) firing / triggering circuit with waveforms	4, 6	S-26 (5b), W-25 (5b), W-24 (2b)	3	High
RC firing / triggering circuit with waveforms	4, 6	S-26 (4a), S-25 (3c), W-24 (5b)	3	High
Light triggering (LASCR)	4	W-25 (2c), W-24 (2d)	2	Medium
Class F (AC line) commutation	4, 6	W-25 (2d), S-25 (5b)	2	Medium
dv/dt protection — snubber circuit (and crowbar)	4, 6	S-26 (6a), W-24 (3a)	2	Medium
dv/dt triggering of SCR	4	S-25 (2d)	1	Low
Compare R and RC triggering	2	W-25 (1b)	1	Low
Define commutation	2	W-25 (1c)	1	Low
Need of SCR protection, list of protection methods	4	W-25 (2b)	1	Low
Over-voltage / over-current protection of SCR	4	S-25 (2b)	1	Low
di/dt protection	4	S-26 (3c)	1	Low
UJT relaxation oscillator triggering	—	Not asked yet (standard syllabus topic)	0	Low

Unit 3: Phase Controlled Rectifiers

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
Need / effect of freewheeling diode in controlled rectifiers	2, 6	S-26 (1f), W-25 (6b), S-25 (5c)	3	High
1- ϕ fully controlled bridge rectifier with R load	4	W-25 (3c), S-25 (4b), W-24 (2c)	3	High
3- ϕ fully controlled bridge rectifier with R load (waveforms, e.g. $\alpha = 30^\circ$)	4	S-26 (2c), W-25 (4a), S-25 (3d)	3	High
1- ϕ half controlled bridge (semi-converter) with RL load and FWD	4, 6	S-26 (3a), W-24 (3d/5c)	3	Medium
Define firing angle and conduction angle	2	S-26 (1c), W-24 (1d)	2	Medium
1- ϕ half wave controlled rectifier with RL load (with / without FWD)	4, 6	W-25 (6b), S-25 (2c)	2	Medium
Compare controlled and uncontrolled rectifiers	2	S-25 (1d)	1	Low
1- ϕ half wave controlled rectifier with R load	4	W-25 (3b)	1	Low
1- ϕ fully controlled (full wave) rectifier with RL load	6	S-26 (5c)	1	Low

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
Compare half and full converter	4	W-24 (3b)	1	Low

Unit 4: Choppers and Inverters

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
Step-down chopper — circuit, waveforms, output voltage equation	4, 6	S-26 (2d), W-25 (4c), S-25 (6c), W-24 (6c)	4	High
1- ϕ full bridge inverter with R / RL load	4, 6	S-26 (6b), W-25 (5c), S-25 (6b), W-24 (4a)	4	High
Pulse width modulation — need, types, PWM circuit, sinusoidal PWM	4	S-26 (4d), W-25 (4b), S-25 (4a), W-24 (4b)	4	High
Chopper terms: TON, TOFF, chopping period, duty cycle	2	S-26 (1b), S-25 (1e), W-24 (1e)	3	High
Chopper control strategies (constant frequency, variable frequency, current limit)	2, 4	S-26 (4c), W-25 (1d), S-25 (4c)	3	High
1- ϕ half bridge inverter with R load	4, 6	S-26 (4b), W-25 (3d), W-24 (6b)	3	High
Step-up chopper — working and output voltage formula	4, 6	W-25 (6c), W-24 (4c)	2	Medium
Applications of chopper	2	W-25 (1e), W-24 (1g)	2	Medium
Compare step-up and step-down chopper	2	S-25 (1g)	1	Low
Buck-boost chopper	4	S-26 (3d)	1	Low
Voltage source inverter — concept	4	S-25 (3b)	1	Low

Unit 5: Applications of Power Electronics

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
AC to AC converter using DC link (block diagram, applications)	2, 4	S-26 (4e), W-25 (1f), S-25 (4e)	3	High
Speed control of ceiling fan using TRIAC	4, 6	S-26 (6c), W-25 (4e), W-24 (4d)	3	High
Photovoltaic cell — define / applications	2	S-25 (1f), W-24 (1f)	2	Medium
Solar power system block diagram (with solar charge controller)	2, 4	W-25 (1g), W-24 (4e)	2	Medium
Wind power generation system (block diagram)	2, 4	W-25 (1f), S-25 (4d)	2	Medium

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
Types of solar charge controller	2	S-26 (1e)	1	Low
Converter station in HVDC	4	W-25 (4d)	1	Low

Top repeated topics (all units)

1. V-I characteristics of SCR; define latching current and holding current (effect of gate current) — in 4 of 4 papers (5 times)
2. Turn-on (triggering) methods of SCR — define triggering, list methods — in 4 of 4 papers (4 times)
3. Class A (load / resonant) commutation — in 4 of 4 papers (4 times)
4. Step-down chopper — circuit, waveforms, output voltage equation — in 4 of 4 papers (4 times)
5. 1- ϕ full bridge inverter with R / RL load — in 4 of 4 papers (4 times)
6. Pulse width modulation — need, types, PWM circuit, sinusoidal PWM — in 4 of 4 papers (4 times)
7. Draw symbols of SCR, TRIAC, IGBT, power MOSFET — in 3 of 4 papers (3 times)
8. Construction / working of IGBT (with +ve gate voltage) — in 3 of 4 papers (3 times)

How to use: prepare every High topic fully (neat circuit diagram + waveforms + working points), then Medium topics. In this subject marks are mostly for **labelled circuit diagrams and waveforms**. The four papers had no numericals, but learn the basic formulas (duty cycle, chopper V_o , rectifier V_{dc}).

Note: This is a **important-questions list prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in