

Digital Techniques (313303)

MSBTE K-Scheme · Computer Engineering (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, 3 hours.

Unit 1: Number Systems and Codes

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
Number system conversions (decimal / binary / octal / hex / BCD, with fractions)	2, 4, 6	S-26 (1a/3a), W-25 (2a), S-25 (2a/6c), W-24 (6c)	6	High
Base / radix and symbols of number systems	2	W-25 (1a), S-25 (1a)	2	Medium
Subtraction using 2's complement	4	S-26 (2c), W-24 (2b)	2	Medium
BCD code - advantages / applications	2	S-26 (1c), W-24 (1a)	2	Medium
Gray code and Excess-3 code conversion	4	S-26 (3a)	1	Low
BCD addition	4	W-25 (4d)	1	Low

Unit 2: Logic Gates, Boolean Algebra and Logic Families

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
Universal gates - realise basic gates using NAND (and NOR)	2, 4	S-26 (2b), W-25 (1b/2b), S-25 (3b), W-24 (3b)	5	High
Boolean laws and simplification using laws	2, 4, 6	S-26 (5a), W-25 (4a), W-24 (1b/1g)	4	High
De Morgan's theorems - state / prove	2, 4	W-25 (1g), S-25 (2b), W-24 (2a)	3	High

Gate symbol and truth table (NAND, EX-NOR); EX-OR vs EX-NOR	2	S-26 (1d), S-25 (1b/1g)	3	Medium
Duality theorem	2, 4	S-26 (1b), S-25 (4a)	2	Medium
Realise a given expression using NAND gates only	4	W-24 (4a)	1	Low
TTL vs CMOS logic families	4	S-26 (3b)	1	Low
Buffer and tristate buffer	4	W-25 (3a)	1	Low

Unit 3: Combinational Logic Circuits

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
K-map minimisation (SOP / POS, 4 variables)	4, 6	S-26 (2a), W-25 (2c/6a), S-25 (4e)	4	High
Half adder / full adder design (truth table, K-map, logic diagram)	2, 4	S-26 (3c), W-25 (1c), S-25 (2c), W-24 (2c)	4	High
MUX tree (16:1 / 32:1 / 8:1 using smaller MUX)	2, 4, 6	S-26 (6a), W-25 (1f), S-25 (3c), W-24 (4c)	4	High
Applications / necessity of MUX and DEMUX	2	S-26 (1e/6a), S-25 (1c), W-24 (1f)	4	High
Standard SOP / POS (canonical) forms	2, 6	W-25 (5a), S-25 (5a), W-24 (1c)	3	High
BCD to 7-segment decoder (truth table, K-map for segments)	4, 6	S-26 (5c), S-25 (4c), W-24 (5a)	3	High
Half subtractor design	2, 4	W-25 (4c), S-25 (1f)	2	Medium
4:1 MUX working; MUX vs DEMUX	4	W-25 (3b), W-24 (4e)	2	Medium
4:2 priority encoder	4	S-26 (4a), W-24 (3c)	2	Medium
Encoder and decoder - functions / applications	2	W-25 (1e)	1	Low
Decoder (3:8) and DEMUX tree - syllabus, not yet asked	—	Not asked yet (syllabus)	0	Low
Full subtractor; MUX as function generator - syllabus, not yet asked	—	Not asked yet (syllabus)	0	Low

Unit 4: Sequential Logic Circuits

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
Asynchronous (ripple) counters - 3-bit, MOD-10; modulus	6	S-26 (6b), W-25 (6b), S-25 (5b), W-24 (5b)	4	High
Shift registers (modes, SISO, SIPO, universal)	2, 4, 6	S-26 (4c), W-25 (2d), W-24 (1d/5c)	4	High
Race-around condition and master-slave JK flip-flop	4, 6	S-26 (5b), W-25 (5c), S-25 (3a)	3	High
SR / D / T flip-flop (clocked, truth or excitation table)	2, 4	W-25 (1d), S-25 (1d), W-24 (3a)	3	High
Synchronous counter design / MOD-N counter (MOD-7)	4, 6	W-25 (5b), S-25 (2d/6a)	3	Medium
Ring counter and twisted ring (Johnson) counter	4, 6	S-26 (4b), W-24 (2d/6a)	3	Medium
Combinational vs sequential circuits	2, 6	S-26 (1f), S-25 (5c)	2	Medium
JK flip-flop - logic diagram, truth table, excitation table	4	S-26 (2d), W-25 (3c)	2	Medium

Unit 5: Data Converters and Memories

Question / topic	Marks	Asked in (Q. no.)	Times	Probability
R-2R ladder DAC (working; compare with weighted resistor)	4, 6	S-26 (3d), W-25 (6c), S-25 (4d), W-24 (6b)	4	High
Memory comparison - SRAM vs DRAM, volatile vs non-volatile	2, 4, 6	S-26 (1g), W-25 (4b), S-25 (6b), W-24 (3d)	4	High
Weighted resistor DAC (diagram, output expression, numerical)	4	W-25 (3d), S-25 (4b), W-24 (4b)	3	High
Successive approximation (SAR) ADC	4	S-25 (3d), W-24 (4d)	2	Medium
ROM types - PROM, EPROM, EEPROM, Flash comparison	4	S-26 (4e), W-25 (4e)	2	Medium
Solid State Drive (SSD) - features, parts, working	2, 6	S-26 (6c), S-25 (1e)	2	Medium
Dual slope ADC	4	S-26 (4d)	1	Low

Applications of ADC	2	W-24 (1e)	1	Low
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Top repeated topics (all units)

1. Number system conversions (decimal / binary / octal / hex / BCD, with fractions) — in 4 of 4 papers (6 times)
2. Universal gates - realise basic gates using NAND (and NOR) — in 4 of 4 papers (5 times)
3. Half adder / full adder design (truth table, K-map, logic diagram) — in 4 of 4 papers (4 times)
4. MUX tree (16:1 / 32:1 / 8:1 using smaller MUX) — in 4 of 4 papers (4 times)
5. Asynchronous (ripple) counters - 3-bit, MOD-10; modulus — in 4 of 4 papers (4 times)
6. R-2R ladder DAC (working; compare with weighted resistor) — in 4 of 4 papers (4 times)
7. Memory comparison - SRAM vs DRAM, volatile vs non-volatile — in 4 of 4 papers (4 times)
8. Boolean laws and simplification using laws — in 3 of 4 papers (4 times)
9. K-map minimisation (SOP / POS, 4 variables) — in 3 of 4 papers (4 times)
10. Applications / necessity of MUX and DEMUX — in 3 of 4 papers (4 times)

How to use: prepare every High topic fully (diagram + table + example), then Medium topics. Numericals (conversions, K-maps, 2's complement, DAC output) come with new values every time — practise the method, not the answer.

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