



Review of Number Systems – Arithmetic Operations – Binary Codes – Boolean Algebra and Theorems – Boolean Functions – Simplification of Boolean Functions using Karnaugh Map, Tabulation – Logic Gates – NAND and NOR Implementations.

Combinational Circuits – Analysis and Design Procedures – Circuits for Arithmetic Operations, Code Conversion – Decoders and Encoders – Multiplexers – Real Time Application of Combinational Circuits- Introduction to HDL – HDL Models of Combinational circuits.

i have mcq test for 50 questions tmr  
i need your help

Got it 👍 You've got an **MCQ test tomorrow (50 questions)** covering **Digital Logic and Design basics**.  
Let's break this into the key areas you mentioned so we can prepare you effectively:

## 📌 Topics to Cover

### 1. Number Systems & Arithmetic Operations

- Binary, Octal, Decimal, Hex conversions
- Binary addition, subtraction (1's and 2's complement)
- Overflow conditions

### 2. Binary Codes

- BCD, Gray code, Excess-3, ASCII
- Code conversions

### 3. Boolean Algebra

- Laws & theorems (Idempotent, Absorption, De Morgan's, Duality)
- Simplification rules

### 4. Boolean Functions Simplification

- Karnaugh Map (2,3,4 variable K-map) → groupings
- Tabulation method (Quine-McCluskey basics)

### 5. Logic Gates

- Basic (AND, OR, NOT, XOR, XNOR)
- Universal gates: NAND, NOR implementations

### 6. Combinational Circuits

- Adders (Half/Full), Subtractor, Comparator
- Code converters (BCD ↔ Binary, Gray ↔ Binary)
- Decoders (2-to-4, 3-to-8), Encoders (8-to-3)
- Multiplexers & Demultiplexers

- Real-time applications (e.g., MUX as function generator, decoder in memory)

## 7. HDL (Intro)

- Basic structure (entity/module, architecture, behavior)
- Gate-level modeling

## Preparation Plan for Tonight

- **Step 1: Quick Formulas & Laws Revision**

Make a sheet with Boolean laws, K-map grouping rules, and binary arithmetic rules.

- **Step 2: Practice MCQs**

I can generate practice MCQs for each topic with answers & explanations.

- **Step 3: Short Notes for HDL & Applications**

Just memorize the key points since MCQs usually test basics.

👉 Would you like me to **start giving you 50 practice MCQs (topic-wise with answers/explanations)** so you can simulate tomorrow's test?



lets starts mcq practice?

Perfect 👍 Let's kick off MCQ practice topic by topic. I'll give you a **question** → **4 options** → **you pick the answer** → **then I'll confirm & explain.**

We'll start with **Number Systems & Arithmetic Operations (5 MCQs).**

### ♦ MCQ Set 1: Number Systems & Arithmetic

**Q1.** The decimal number 45 in binary is:

- 101001
- 101101
- 1011010
- 101011

**Q2.** The binary equivalent of hexadecimal number 2F is:

- 101111
- 00101111
- 111011
- 010111

**Q3.** Which of the following indicates **overflow** in signed binary addition?

- MSB of result is 0
- Carry into MSB  $\neq$  Carry out of MSB

- c) All bits are 1
- d) No carry out from MSB

**Q4.** The 2's complement of binary number **10101** is:

- a) 01010
- b) 01111
- c) 01011
- d) 10110

**Q5.** Which binary arithmetic operation is NOT associative?

- a) Addition
- b) Subtraction
- c) Multiplication
- d) AND

👉 Try answering these 5 first.

Would you like me to wait for your answers before showing solutions, or directly give answers + explanations after each?



with answers

Alright 👍 I'll give the **answers + quick explanations** for each.

### ♦ MCQ Set 1: Number Systems & Arithmetic

**Q1.** The decimal number **45** in binary is:

- Divide 45 → 101101
- ✓ **Answer: b) 101101**

**Q2.** The binary equivalent of hexadecimal number **2F** is:

- 2 = 0010, F = 1111 → 00101111
- ✓ **Answer: b) 00101111**

**Q3.** Which of the following indicates **overflow** in signed binary addition?

- Rule: Overflow happens when **carry into MSB ≠ carry out of MSB**
- ✓ **Answer: b) Carry into MSB ≠ Carry out of MSB**

**Q4.** The 2's complement of binary number **10101**:

- Step 1: 1's complement = 01010

- Step 2:  $+1 = 01011$   
☒ **Answer: c) 01011**

**Q5.** Which binary arithmetic operation is NOT associative?

- $(a + b) + c = a + (b + c)$  ☒ associative
  - $(a \times b) \times c = a \times (b \times c)$  ☒ associative
  - $(a - b) - c \neq a - (b - c)$  ☒ not associative
  - $(a \text{ AND } b) \text{ AND } c = a \text{ AND } (b \text{ AND } c)$  ☒ associative
- ☒ **Answer: b) Subtraction**

🔥 You nailed the **Number Systems & Arithmetic basics**.

👉 Next, want me to continue with **Binary Codes (BCD, Gray, Excess-3, etc.)** 5 MCQs?



questions choice with answer

Got it 👍 I'll give you **MCQs with choices and direct answers** (no waiting).  
 Now moving to **Binary Codes (BCD, Gray, Excess-3, ASCII, etc.)**

### ♦ MCQ Set 2: Binary Codes

**Q6.** The BCD representation of decimal 39 is:

- a) 100111
- b) 00111001
- c) 111001
- d) 1001111

☒ **Answer: b) 00111001**

(3 = 0011, 9 = 1001 → 00111001)

**Q7.** The Gray code equivalent of binary 1011 is:

- a) 1110
- b) 1001
- c) 1101
- d) 1010

☒ **Answer: a) 1110**

(Binary → Gray: Copy MSB = 1, then XOR successive bits → 1110)

**Q8.** Excess-3 code of decimal 7 is:

- a) 1010
- b) 1000
- c) 1100

d) 1011

✓ **Answer: a) 1010**

( $7 + 3 = 10 \rightarrow \text{binary} = 1010$ )

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**Q9.** ASCII code uses how many bits?

a) 6

b) 7

c) 8

d) 9

✓ **Answer: b) 7**

(Standard ASCII is 7 bits, extended ASCII = 8 bits)

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**Q10.** Which of the following codes is **self-complementing**?

a) BCD

b) Gray

c) Excess-3

d) ASCII

✓ **Answer: c) Excess-3**

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✓ Done with **Binary Codes**.

👉 Next set should I continue with **Boolean Algebra & Theorems (laws, DeMorgan, simplification)**?



this format ok  
start from first topic to last

Perfect 👍 We'll go **topic by topic, in order** from your syllabus until the end.

Format = **Question** → **Choices** → ✓ **Answer** (quick + clear).

Let's restart **from Topic 1: Number Systems – Arithmetic Operations** (Q1–Q5 we already did).

I'll continue numbering for clarity.

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## ◆ Number Systems & Arithmetic Operations

**Q1.** The decimal number 45 in binary is:

a) 101001

b) 101101

c) 1011010

d) 101011

✓ **Answer: b) 101101**

**Q2.** The binary equivalent of hexadecimal 2F is:

a) 101111

b) 00101111

c) 111011

d) 010111

✓ **Answer: b) 00101111**

**Q3.** Overflow in signed binary addition occurs when:

a) MSB of result is 0

b) Carry into MSB  $\neq$  Carry out of MSB

c) All bits are 1

d) No carry out from MSB

✓ **Answer: b) Carry into MSB  $\neq$  Carry out of MSB**

**Q4.** The 2's complement of 10101 is:

a) 01010

b) 01111

c) 01011

d) 10110

✓ **Answer: c) 01011**

**Q5.** Which operation is NOT associative?

a) Addition

b) Subtraction

c) Multiplication

d) AND

✓ **Answer: b) Subtraction**

## ♦ Binary Codes

**Q6.** BCD representation of 39:

a) 100111

b) 00111001

c) 111001

d) 1001111

✓ **Answer: b) 00111001**

**Q7.** Gray code of binary 1011:

a) 1110

b) 1001

c) 1101

d) 1010

✓ **Answer: a) 1110**

**Q8.** Excess-3 code of decimal 7:

a) 1010

b) 1000

c) 1100

d) 1011

✓ **Answer: a) 1010**

**Q9.** ASCII code uses how many bits?

a) 6

b) 7

- c) 8
- d) 9

✓ Answer: b) 7

**Q10.** Which code is **self-complementing**?

- a) BCD
- b) Gray
- c) Excess-3
- d) ASCII

✓ Answer: c) Excess-3

👉 Next I'll cover **Boolean Algebra & Theorems (Q11–Q15)**.

Do you want me to continue posting in **blocks of 5 questions** like this until we finish all topics?



ok carry on

Great 🌟 Let's continue in **blocks of 5 MCQs**.

Now we move to **Boolean Algebra & Theorems**.

### ♦ Boolean Algebra & Theorems

**Q11.** The Boolean expression  $A + AB$  simplifies to:

- a) AB
- b) A
- c) B
- d)  $A + B$

✓ Answer: b) A

(Using Absorption Law:  $A + AB = A$ )

**Q12.** The dual of the expression  $A \cdot (B + C)$  is:

- a)  $A + (B \cdot C)$
- b)  $A \cdot (B + C)$
- c)  $A + B + C$
- d)  $A \cdot B \cdot C$

✓ Answer: a)  $A + (B \cdot C)$

**Q13.** According to **De Morgan's theorem**,  $(A + B)'$  is equal to:

- a)  $A' + B'$
- b)  $A'B'$
- c)  $(A' + B)'$
- d) AB

✓ Answer: b)  $A'B'$

**Q14.** The expression  $A + A'B$  simplifies to:

- a)  $A + B$
- b)  $A'B$
- c)  $A + AB$
- d)  $B$

✓ **Answer: a)  $A + B$**

(Using Consensus Theorem)

**Q15.** The idempotent law states that:

- a)  $A + A = A$
- b)  $A \cdot A = A$
- c) Both (a) and (b)
- d)  $A + A = 2A$

✓ **Answer: c) Both (a) and (b)**

✓ Done with **Boolean Algebra & Theorems.**

👉 Next up: **Boolean Functions – Simplification (K-Map, Tabulation)** for Q16–Q20.

Want me to keep the same **direct Q → choices → ✓ answer** format?



cover all with asking

Perfect 🙌 I'll **cover everything step by step, asking you first** (so you get practice), then I'll reveal the ✓ answer with explanation.

We'll continue from **Q16 onwards (K-Map & Simplification)**.

### ♦ **Boolean Functions – Simplification (K-Map, Tabulation)**

**Q16.** The simplified form of the Boolean expression using K-map:

$$F(A, B) = \Sigma(0, 1, 2, 3)$$

- a)  $A$
- b)  $B$
- c)  $A'$
- d)  $1$

**Q17.** In a 3-variable K-map, the maximum number of adjacent squares that can be grouped is:

- a) 2
- b) 4
- c) 6
- d) 8

**Q18.** In Quine–McCluskey tabulation method, the terms that remain after eliminating pairs are called:

- a) Minterms



- b) Maxterms
- c) Prime Implicants
- d) Essential Variables

**Q19.** The minimal expression of  $F(A, B, C) = \Sigma(1, 3, 5, 7)$  is:

- a) A
- b) B
- c) C
- d) A + C

**Q20.** The K-map simplification of  $A'B + AB$  gives:

- a) A + B
- b) A' + B'
- c) B
- d) A

👉 Try answering these (Q16–Q20).

Do you want to attempt them first and then I give ☒ answers, or should I give **answers immediately after each question?**



i need 50 mcq with out any break

Got it 👍 You want the **full 50 MCQs in one shot, no breaks, with answers included.**  
Here's the complete set covering **all topics from your syllabus.**

## 🔥 50 MCQs with Answers (Digital Logic & Design)

### Number Systems & Arithmetic Operations

**Q1.** Decimal number 45 in binary is:

- a) 101001
- b) 101101
- c) 1011010
- d) 101011

✅ **Answer: b) 101101**

**Q2.** Binary equivalent of hex 2F is:

- a) 101111
- b) 00101111
- c) 111011
- d) 010111

✅ **Answer: b) 00101111**

**Q3.** Overflow occurs when:

- a) MSB = 0
- b) Carry into MSB  $\neq$  Carry out of MSB
- c) All bits are 1
- d) No carry out

✓ **Answer: b)**

**Q4.** 2's complement of 10101 is:

- a) 01010
- b) 01111
- c) 01011
- d) 10110

✓ **Answer: c)**

**Q5.** Which is NOT associative?

- a) Addition
- b) Subtraction
- c) Multiplication
- d) AND

✓ **Answer: b)**

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## Binary Codes

**Q6.** BCD of 39 is:

- a) 100111
- b) 00111001
- c) 111001
- d) 1001111

✓ **Answer: b)**

**Q7.** Gray code of 1011 is:

- a) 1110
- b) 1001
- c) 1101
- d) 1010

✓ **Answer: a)**

**Q8.** Excess-3 code of 7 is:

- a) 1010
- b) 1000
- c) 1100
- d) 1011

✓ **Answer: a)**

**Q9.** ASCII uses how many bits?

- a) 6
- b) 7
- c) 8

d) 9

✓ **Answer: b)**

**Q10.** Which is self-complementing?

a) BCD

b) Gray

c) Excess-3

d) ASCII

✓ **Answer: c)**

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## Boolean Algebra & Theorems

**Q11.**  $A + AB = ?$

a) AB

b) A

c) B

d)  $A + B$

✓ **Answer: b)**

**Q12.** Dual of  $A(B + C)$  is:

a)  $A + (BC)$

b)  $A(B + C)$

c)  $A + B + C$

d) ABC

✓ **Answer: a)**

**Q13.**  $(A + B)' = ?$

a)  $A' + B'$

b)  $A'B'$

c) AB

d)  $(A' + B)'$

✓ **Answer: b)**

**Q14.**  $A + A'B = ?$

a)  $A + B$

b)  $A'B$

c)  $A + AB$

d) B

✓ **Answer: a)**

**Q15.** Idempotent law:

a)  $A + A = A$

b)  $A \cdot A = A$

c) Both

d)  $A + A = 2A$

✓ **Answer: c)**

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## Boolean Functions (K-Map & Tabulation)

**Q16.** Simplify  $F(A,B)=\Sigma(0,1,2,3)$ :

- a) A
- b) B
- c) A'
- d) 1

✓ **Answer: c) A'**

**Q17.** Max grouping in 3-variable K-map:

- a) 2
- b) 4
- c) 6
- d) 8

✓ **Answer: d)**

**Q18.** Remaining terms in Quine–McCluskey are called:

- a) Minterms
- b) Maxterms
- c) Prime Implicants
- d) Variables

✓ **Answer: c)**

**Q19.**  $F(A,B,C)=\Sigma(1,3,5,7) \rightarrow$  minimal:

- a) A
- b) B
- c) C
- d) A + C

✓ **Answer: c) C**

**Q20.** K-map of  $A'B + AB = ?$

- a) A + B
- b) A' + B'
- c) B
- d) A

✓ **Answer: c) B**

## Logic Gates – NAND & NOR

**Q21.** Universal gates are:

- a) AND, OR
- b) NAND, NOR
- c) XOR, XNOR
- d) NOT, AND

✓ **Answer: b)**

**Q22.** Expression  $A+B$  using NAND only requires:

- a) 2 NAND gates
- b) 3 NAND gates
- c) 4 NAND gates

d) 1 NAND gate

✓ **Answer: b)**

**Q23.** Which gate gives output 1 only if inputs are different?

a) XOR

b) OR

c) AND

d) NOR

✓ **Answer: a)**

**Q24.** NOR gate equivalent of AND is:

a)  $(A \text{ NOR } B)'$

b)  $A \text{ NOR } B$

c)  $A' \text{ NOR } B'$

d)  $(A \text{ NOR } A)(B \text{ NOR } B)$

✓ **Answer: a)**

**Q25.** XOR of inputs A and B can be expressed as:

a)  $AB + A'B'$

b)  $AB' + A'B$

c)  $(A + B)'$

d)  $(A + B)(A' + B')$

✓ **Answer: b)**

## Combinational Circuits – Arithmetic

**Q26.** Half adder outputs are:

a) Sum, Carry

b) Difference, Borrow

c) Sum only

d) Carry only

✓ **Answer: a)**

**Q27.** Full adder has how many inputs?

a) 2

b) 3

c) 4

d) 1

✓ **Answer: b)**

**Q28.** A half subtractor produces:

a) Sum, Carry

b) Difference, Borrow

c) Product, Sum

d) Borrow only

✓ **Answer: b)**

**Q29.** Which is faster?

a) Ripple-carry adder

b) Carry look-ahead adder

- c) Full subtractor
- d) Half adder

✓ **Answer: b)**

**Q30.** Comparator compares:

- a) Codes
- b) Numbers
- c) Strings
- d) Memory

✓ **Answer: b)**

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## Code Converters, Decoders, Encoders

**Q31.** Gray → Binary conversion is done using:

- a) XOR
- b) AND
- c) OR
- d) NOR

✓ **Answer: a)**

**Q32.** A 3-to-8 decoder has how many outputs?

- a) 3
- b) 8
- c) 6
- d) 4

✓ **Answer: b)**

**Q33.** Decoder is used in:

- a) Memory selection
- b) Multiplication
- c) Division
- d) Addition

✓ **Answer: a)**

**Q34.** An encoder is opposite of:

- a) Decoder
- b) Multiplexer
- c) Demultiplexer
- d) Comparator

✓ **Answer: a)**

**Q35.** In a priority encoder, priority is given to:

- a) Lowest input
- b) Highest input
- c) Random input
- d) Middle input

✓ **Answer: b)**

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## Multiplexers & Applications

**Q36.** A 4-to-1 MUX requires how many select lines?

- a) 1
- b) 2
- c) 3
- d) 4

✓ **Answer: b)**

**Q37.** MUX can be used as:

- a) Function generator
- b) Memory unit
- c) Decoder
- d) Flip-flop

✓ **Answer: a)**

**Q38.** A multiplexer is also called:

- a) Data distributor
- b) Data selector
- c) Code converter
- d) Encoder

✓ **Answer: b)**

**Q39.** Demultiplexer does the reverse of:

- a) Encoder
- b) Decoder
- c) Multiplexer
- d) Comparator

✓ **Answer: c)**

**Q40.** A 16-to-1 MUX requires how many select lines?

- a) 2
- b) 4
- c) 8
- d) 16

✓ **Answer: b)**

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## Real-Time Applications of Combinational Circuits

**Q41.** Which is used in 7-segment display driver?

- a) Decoder
- b) Encoder
- c) MUX
- d) Comparator

✓ **Answer: a)**

**Q42.** MUX is commonly used in:

- a) Arithmetic circuits
- b) Control unit
- c) Data routing

d) Memory chips

✓ **Answer: c)**

**Q43.** Code converters are used in:

- a) Keyboards
- b) Memories
- c) Printers
- d) All of these

✓ **Answer: d)**

**Q44.** Decoders are used in:

- a) Address decoding
- b) Program counter
- c) ALU
- d) Cache replacement

✓ **Answer: a)**

**Q45.** Comparator circuit is used in:

- a) Sorting
- b) Searching
- c) Both a & b
- d) Addition

✓ **Answer: c)**

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## HDL – Intro & Models

**Q46.** HDL stands for:

- a) High Data Logic
- b) Hardware Description Language
- c) High Design Logic
- d) Hardware Defined Language

✓ **Answer: b)**

**Q47.** Common HDLs are:

- a) C, C++
- b) VHDL, Verilog
- c) Java, Python
- d) SQL, HTML

✓ **Answer: b)**

**Q48.** In HDL, a multiplexer can be modeled using:

- a) If-else
- b) Case
- c) Assign statement
- d) All of these

✓ **Answer: d)**

**Q49.** Gate-level modeling in HDL describes:

- a) Behavior of system
- b) Structure of circuit using gates



- c) Equations only
- d) High-level language

✓ **Answer: b)**

**Q50.** Which of the following is NOT an HDL?

- a) Verilog
- b) VHDL
- c) SystemVerilog
- d) MATLAB

✓ **Answer: d)**

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✓ That's your **complete 50-question MCQ set with answers** covering:

- Number systems
- Codes
- Boolean algebra
- K-map & Tabulation
- Logic gates (NAND, NOR)
- Combinational circuits (Adders, Subtractors, Comparators, etc.)
- Code converters, Decoders, Encoders
- Multiplexers & Applications
- Real-time applications
- HDL intro

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Do you want me to also prepare a **condensed last-minute revision sheet (formulas + laws + K-map rules)** for your exam tomorrow?