NUMBER SYSTEMS

MCQS & Short Questions

1. What is the base of the decimal number system?

a) 2 b) 8
c) 10 d) 16

2. Which digits are used in the decimal system?

a) 0–1 b) 0–7
c) 0–9 d) 0–15

3. The binary system is also known as the __ system.

a) Base-2 b) Base-4
c) Base-8 d) Base-10

4. In binary, the digit '1' represents:

a) OFF **b) ON**
c) Error d) Decimal

5. Which number system do computers use to process and store data?

a) Decimal **b) Binary**
c) Octal d) Hexadecimal

6. What is the decimal value of the binary number 1011?

a) 8 b) 10
c) 15 **d) 11**

7. The base of the octal number system is:

a) 2 **b) 8**
c) 10 d) 16

8. The octal number system uses digits from:

a) 0–7 b) 0–8
c) 1–8 d) 1–7

9. One octal digit corresponds to how many binary digits?

a) 2 **b) 3**
c) 4 d) 8

10. The binary number 111 corresponds to which octal digit?

a) 5 b) 6
c) 7 d) 3

11. To convert decimal to octal, you repeatedly divide the number by:

a) 2 b) 10
c) 8 d) 16

12. The base of the hexadecimal number system is:

a) 8 b) 10
c) 2 **d) 16**

13. The hexadecimal system uses the following digits:

a) 0–7 **b) 0–9 and A–F**
c) 1–9 and A–E d) 0–9 only

14. The hexadecimal digit 'A' represents the decimal value:

a) 9 **b) 10**
c) 11 d) 12

15. How many binary digits (bits) represent one hexadecimal digit?

a) 2 b) 3
c) 4 d) 8

16. The binary number 1111 corresponds to which hexadecimal digit?

a) F b) E
c) C d) D

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17. To convert decimal to hexadecimal, you repeatedly divide by:
a) 2 b) 8
c) 10 **d) 16**

18. Whole numbers (W) include:
a) Only positive numbers **b) Zero and all positive integers**
c) Negative and positive numbers d) Fractions only

19. The set of integers (Z) is represented as:
a) {0, 1, 2, 3, …} b) {1, 2, 3, …}
c) {…, –3, –2, –1, 0, 1, 2, …} d) {0, –1, –2, –3}

20. A 1-byte whole number can store a maximum value of:
a) 127 b) 128
c) 255 d) 256

21. Which bit is used as the sign bit in signed integers?
a) Least significant bit b) Middle bit
c) Most significant bit d) All bits

22. Two's complement is used to represent:
a) Only positive numbers **b) Negative numbers**
c) Fractions d) Decimal numbers only

23. In two's complement, the first step to find negative values is:
a) Add 2 **b) Invert all bits**
c) Divide by 2 d) Shift bits left

24. What does ASCII stand for?
a) American System Code for International Information **b) American Standard Code for Information Interchange**
c) Advanced Standard Coding for Internet Information d) Alphabetic System Code for International Interchange

25. ASCII uses how many bits?
a) 7 bits b) 8 bits
c) 16 bits d) 32 bits

26. How many code numbers does ASCII use?
a) 0–255 b) 0–100
c) 0–127 d) 1–127

27. ASCII is mainly used for encoding:
a) Text characters b) Sounds
c) Images d) Videos

28. What is the ASCII code for lowercase 'a'?
a) 65 b) 97
c) 80 d) 116

29. Extended ASCII uses how many bits?
a) 7 bits **b) 8 bits**
c) 16 bits d) 32 bits

30. Unicode can represent over:
a) 128 characters b) 256 characters
c) 1 million characters d) 512 characters

31. UTF-8 uses:
a) Fixed length of 2 bytes b) 4 bytes always
c) Variable length (1 to 4 bytes) d) Only 1 byte

32. UTF-32 stores every character in:
a) 1 byte b) 2 bytes
c) 3 bytes **d) 4 bytes**

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Q1. Define number system.

A number system is a quantity to represent numeric data. The total number of digits used in a number system is called its base or radix.

Q2. What is the purpose of numbering systems?

Numbering systems are essential in computing because they form the basis for representing, storing, and processing data. Numbering system provide facility of calculations, data transfer and storage.

Q3. What is decimal number system?

The decimal number system consists of ten digits from 0 to 9. The base of decimal number system is 10. It is the positional number system. It is the most widely used number system.

Q4. What is binary number system?

Binary number system consists of two digits 0 and 1. Its base is 2. Each digit or bit in binary number system can be 0 or 1. The weight of each position in binary number is a power of 2. This number system is used by computer. e.g,. $110110_{(2)}$

Q5. Why does digital computer use binary representation?

The electronic circuits used in digital computers have two states ON or OFF. The reason for using binary representation is that computing operations are become simple and fast with two states.

Q6. Define octal system?

Octal Number system consists of eight digits from 0 to 7. Octal is a positional numeral system with base eight. e.g. $725_{(8)}$

Q7. What is meant by hexadecimal number system?

The hexadecimal system consists of 16 digits from 0 to 9 and A to F. The alphabetic (A to F) are used to represent decimal numbers from 10 to 15. The base of this number system is 16. It is positional number system. e.g. $AB07_{(16)}$

Q8. How data is represented in computer memory?

In Digital Computer Data is represented in binary form (0,1). Everything stored in computer is in binary form whether it is a text, image or numbers.

Q9. What is the difference between integer and whole number?

Integer (Z)	Whole Number (W)
Integer is whole number without fractions or decimal. Integer include positive, negative and zero (0) value. Example: 0, 1, 2, 3 …	Whole Numbers are set of non-negative integers. Example: –2, –1, 0, 1, 2 …

Q10. How negative integer is represented in binary?

To store negative values, computer use a method called Two's complement.

1. Invert all bits (0 to 1, 1 to 0)
2. Add 1 to the result

This final binary value represents the negative number.

Q11. What is the purpose of a sign bit?

The sign bit indicates whether a number is positive or negative. 1 mean negative and 0 mean positive.

Q12. What is two's complement?

Two's complement is a method used by computers to store negative integers in binary.

Q13. Write the procedure to find Two's Complement.

To find the Two's Complement of binary number follow these steps.

1. Invert all bits (0 to 1, 1 to 0)
2. Add 1 to the result

Q14. How we can calculate the minimum and maximum in signed integer value from number of bits?

The general formula for calculate minimum value in n bits = $\mathbf{-2^{n-1}}$

The general formula for calculate maximum value in n bits = $\mathbf{2^{n-1}-1}$

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Q15. What is the minimum and maximum value of a 1-byte whole number / unsigned integer?

The minimum value of 1-byte whole number is 0 and maximum value is 255.

Range = 0 to 255 (because $2^8 - 1 = 255$).

Q16. What is the range of values for an unsigned 2-byte integer?

A 2-byte integer has 16 bits. Range = 0 to 65,535 (because $2^{16} - 1 = 65,535$).

Q17. What is the benefit of using unsigned integers?

Unsigned integers can store only positive values, so they can represent a larger maximum number using the same number of bits.

Q18. How does the number of bits affect the range of integer values?

More bits allow the computer to store bigger numbers. Each extra bit doubles the range of values that can be represented.

Q19. How fractional values can be stored in computers?

In Computers real values or fractional values having decimal point are represented in floating point number.

Q20. What is the primary purpose of the ASCII encoding scheme?

ASCII uses 7 or 8 bits to represent English letters, numbers, and symbols in computers using binary code. It assigns a unique number to each character so computers can store and process text.

Q21. What is ASCII?

ASCII stands for American Standard Code for Information Interchange. It is a character encoding standard used to represent letters, numbers, and symbols in computers.

Q22. Why is ASCII important?

ASCII allows different computers and devices to exchange text information using standardized numeric codes.

Q23. How many characters can ASCII represent?

ASCII can represent 128 characters (from code 0 to 127).

Q24. What is Extended ASCII?

Extended ASCII is 8 bits encoding scheme includes additional symbols, accented letters and other characters. In Extended ASCII any character is represented by 8 bits code.

Q25. What is Unicode?

Unicode is a universal character-encoding standard that can represent characters from all languages of the world.

Q26. Explain the difference between ASCII and Unicode.

ASCII	Unicode
ASCII can represent only 128 or 256 characters, mainly for English.	Unicode can represent more than one million characters, including symbols and languages from all over the world.

Q27. How does Unicode handle characters from different languages?

Unicode gives a unique code to every character from every language. This allows computers to correctly display text in languages such as Urdu, Arabic, Chinese, and many others.

Q28. What is UTF-8?

UTF-8 is a variable-length Unicode encoding scheme that uses 1 to 4 bytes for each character and is backward compatible with ASCII.

Example 1: English letter 'A', Unicode: U+0041, UTF-8 binary: 01000001. It uses 1 byte.

Example 2: Urdu letter 'ب' , Unicode: U+0628, UTF-8 binary: 11011000 10101000. It uses 2 bytes.

Q29. What is UTF-16?

UTF-16 is a variable-length Unicode encoding scheme uses 2 or 4 bytes to represent every character and it is not compatible with ASCII.

Example 1: English letter 'A' Unicode: U+0041, UTF-16 binary: 00000000 01000001. It uses 2 bytes

Example 2: Urdu letter 'ب' Unicode: U+0628, UTF-16 binary: 00000110 00101000. It uses 2 bytes.

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Q30. What is UTF-32?

UTF-32 is a fixed length Unicode encoding scheme use 4 bytes to represent every character, making it simple but uses more memory.

Example 1: English letter 'A' Unicode: U+0041, UTF-32 binary: 00000000 00000000 00000000 01000001. It uses 2 bytes.

Q31. What are Binary arithmetic operations?

Computer performs binary arithmetic operations by using binary numbers (0s or 1s). These operations are addition, subtraction, multiplication and division similar to the operations in decimal number.

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