Quantum Computing - MCQs

1. In quantum computing, what is the basic unit of information?
    a) Giga
    b) Qubit
    c) Bit
    d) Byte

    Answer: Qubit

2. What do we call the pieces of information in a quantum computer?
    a) Bits
    b) Qubits
    c) Bytes
    d) Qubytes

    Answer: B

3. When the information is between 0 and 1 in a quantum computer, what do we call this?
    a) Superposition
    b) Same position
    c) Ordinary position
    d) Different position

    Answer: A

4. Quantum computers are very good at dealing with_____
    a) Clarity
    b) Certainty
    c) Uncertainty
    d) Reliability

    Answer: C

5. What does 'entanglement' mean?
    a) Two particles are different
    b) Two particles are separate
    c) Two particles are independent
    d) Two particles are connected

    Answer: D

6. What can quantum computers be used for?
    a) Artificial Intelligence
    b) Simulations/Predictions
    c) Both (A) and (B)
    d) Google Docs and Slides

    Answer: C

7. When the two members of a Qubit pair exist in a single quantum state, it is known as _____.
    a) Entanglement
    b) Engagement
    c) Superposition

d) None of the Above

Answer: A

8. Quantum computing is relatively _____ than classical computing.
    a) Faster
    b) Slower
    c) Average
    d) None of the Above

Answer: A

9. Qubit stands for _____
    a) Quality bits
    b) Question bit
    c) Quantum gates
    d) Quantum bit

Answer: D

10. A qubit is a _____quantum-mechanical system.
    a) One-state
    b) Two-state
    c) Three-state
    d) Four-state

Answer: B

11. The set of vectors and set of scalars which follow the same properties followed by linear vector space is said be
    a. Basis
    b. Dimension
    c. Hilbert space
    d. Orthogonal state

Answer: C

12. It is the process of replacing i^{th} row of the matrix by i^{th} column, then it is said to be …….
    a. Conjugate Matrix
    b. Transpose Matrix
    c. Identity Matrix
    d. Hermitian Operator

Answer: B

13. The operators change with time while the state vectors remain constant, then it is said to be
    a. Schrodinger representation
    b. Heisenberg representation
    c. Interaction representation
    d. None of the above

Answer : B

14. The operators remain constant while the state vectors change with time, then it is said to be
    a. Schrodinger representation
    b. Heisenberg representation
    c. Interaction representation
    d. None of the above

Answer : A

15. The diagonal entries of a Hermitian matrix must be
    a. Complex conjugate
    b. Real
    c. Both real & Complex conjugate
    d. None of the above

Answer : B

16. The eigen value of a Hermitian matrix must be
    a. Complex conjugate
    b. Real
    c. Both real & Complex conjugate
    d. None of the above

Answer : B

17. What is a vector space?
    a. A space consisting of only vectors
    b. A set of vectors closed under addition and scalar multiplication
    c. A space that includes both vectors and scalars
    d. A space that is always three-dimensional

Answer: b. A set of vectors closed under addition and scalar multiplication

18. What is the dimension of a vector space?
    a. The size or length of a vector
    b. The number of vectors in the space
    c. The maximum number of linearly independent vectors that span the space
    d. The number of elements in the basis of the space

Ans: c. The maximum number of linearly independent vectors that span the space

19. What is the span of a set of vectors?
    a. The set of all vectors in the vector space
    b. The linear combination of all vectors in the set
    c. The set of vectors that are orthogonal to the given set
    d. The set of vectors that are linearly independent

Answer: b. The linear combination of all vectors in the set

20. In a finite-dimensional vector space, what is the maximum number of linearly independent vectors a basis can have?
    a. 0
    b. 1
    c. The dimension of the vector space
    d. The size of the vector space

Answer: c. The dimension of the vector space

21. Moore's Law originally stated that the number of transistors on a microchip would double approximately every:
    a. 6 months
    b. 1 year
    c. 2 years
    d. 5 years

Answer: c. 2 years

22. What fundamental technology trend enabled the continuation of Moore's Law for several decades?
    a. Miniaturization of transistors
    b. Increase in clock speed
    c. Expansion of data storage
    d. Advancements in software algorithms

Answer: a. Miniaturization of transistors

23. Which component of a computer is primarily affected by Moore's Law?
    a. Central Processing Unit (CPU)
    b. Random Access Memory (RAM)
    c. Hard Disk Drive (HDD)
    d. Graphics Processing Unit (GPU)

Answer: a. Central Processing Unit (CPU)

24. What is one of the main factors contributing to the end of Moore's Law?
    a. Decreased demand for computing power
    b. Physical limits of miniaturization
    c. Lack of innovation in software development
    d. Increasing costs of semiconductor production

Answer: b. Physical limits of miniaturization

25. Which alternative approaches are being explored to extend computing power beyond the limits of Moore's Law?
    a. Quantum computing
    b. Neuromorphic computing
    c. Optical computing
    d. All of these

Answer: d. All of these

26. What is the fundamental unit of information in quantum computing?
    a. Bit
    b. Byte
    c. Qubit
    d. Quantum gate

Answer: c. Qubit

27. In classical computing, information is processed using bits. What are the two possible values for a classical bit?
    a. 0 and 1
    b. True and False
    c. -1 and 1
    d. Red and Blue

Answer: a. 0 and 1

28. Which property allows qubits to represent multiple states simultaneously in quantum computing?
    a. Superposition
    b. Entanglement
    c. Interference
    d. Tunnelling
    Answer: a. Superposition

29. In a CNOT gate, you create a(n) _____ with two qubits.
    a. Superposition
    b. Entangled state
    c. Bloch
    d. Hadamard

    Answer: b. Entangled state

30. In a quantum circuit, this gate is used to place a qubit into superposition.
    a. Hadamard
    b. X-gate
    c. Bloch
    d. CNOT

    Answer: a. Hadamard

31. This quantum gate acts on a single qubit and would most be similar to a traditional NOT gate.
    a. CNOT
    b. X-Gate
    c. Hadamard
    d. Deutsch Gate

    Answer: b. X-Gate

32. What is superposition in quantum computing?
    a. A state in which a qubit can exist in multiple states simultaneously
    b. The process of entangling multiple qubits
    c. A gate used to manipulate qubits
    d. A unit of quantum information

Answer: a. A state in which a qubit can exist in multiple states simultaneously

33. What happens to the entanglement of qubits when they are physically separated
    a. The entanglement is lost
    b. The entanglement remains intact
    c. The entanglement becomes stronger
    d. The entanglement becomes weaker

Answer: b. The entanglement remains intact

34. What is the purpose of quantum gates in quantum computing?
    a. To entangle qubits
    b. To collapse superposition
    c. To manipulate qubits
    d. To measure qubit states

Answer: c. To manipulate qubits

35. What does 'entanglement' mean?
    a) Two particles are different
    b) Two particles are separate
    c) Two particles are independent
    d) Two particles are connected

Answer : d) Two particles are connected

36. A qubit is a _____quantum-mechanical system.
    a) One-state
    b) Two-state
    c) Three-state
    d) Four-state

Answer : b) Two-state

37. What is the purpose of quantum gates in quantum computing?
    a) To entangle qubits
    b) To collapse superposition
    c) To manipulate qubits
    d) To measure qubit states

Answer : C) To manipulate qubits

38. Quantum computers are very good at dealing with_____
    a) Clarity
    b) Certainty
    c) Uncertainty
    d) Reliability
    Answer : C) Uncertainty

39. Pauli's matrices are
    a) Unitary
    b) Reversible
    c) Both unitary and reversible
    d) None of the above
    Answer: (C)

40. If <0|0>=1 is called
    a) Normalized
    b) Orthogonal
    c) Hermitian
    d) Orthonormal
    Answer: (a)

41. |0> and |1> are orthogonal if:
    a) They are perpendicular
    b) They are parallel
    c) Angle between them is 0
    d) Linearly independent
    Answer: (A)

42. In a linear vector space, linearly dependent and linearly independent vectors are
    a) If all the scalars are equal to 0 and some scalars are not equal to 0.
    b) If some scalars are not equal to 0 and all the scalars are equal to 0.
    c) Both the case scalars are equal to 0
    d) Both the case scalars are not equal to 0.
    Answer: (B)

43. Advantage of qubit over bit is,
    a) It works in spin up state
    b) It works in spin down state
    c) It also works in super posed state
    d) All the above
    Answer: (C)
44. Quantum gates are unitary in nature. Because of,
    a) Superposed state
    b) Spin up state
    c) Spin down state
    d) Normalization condition.
    Answer: (D)

45. Which quantum gate work as flip flop gate?
    a) Z gate
    b) Y gate
    c) X gate
    d) None of the above
    Answer: (X)

46. Which quantum gate can take the qubit to super posed state?
    a) X gate
    b) Y gate
    c) Z gate
    d) Hadamard gate
    Answer: (D)

47. In $|\Psi\rangle = \alpha|0\rangle + \beta|1\rangle$, α, β represents,
    a) Ground state and excited state
    b) Probability density
    c) Probability amplitude
    d) All the above
    Answer: (C)

48. In $|\Psi\rangle = \alpha|0\rangle + \beta|1\rangle$, if $\alpha=1$ then,
    a) Probability of finding the electron in the ground state is high
    b) Probability of finding the electron in the excited state is high
    c) Probability of finding the electron in the superposed state is high
    d) None of the above
    Answer: (A)

49. In $|\Psi\rangle = \alpha|0\rangle + \beta|1\rangle$, if $\beta =1$ then,
    a) Probability of finding the electron in the ground state is high
    b) Probability of finding the electron in the excited state is high
    c) Probability of finding the electron in the superposed state is high
    d) None of the above
    Answer: (B)

50. In $|\Psi\rangle = \alpha|0\rangle + \beta|1\rangle$, if α and $\beta = \frac{1}{\sqrt{2}}$ then,
    a) Probability of finding the electron in the ground state is high
    b) Probability of finding the electron in the excited state is high
    c) Probability of finding the electron in the superposed state is high
    d) None of the above
    Answer: (C)

* * * * * * * * *