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Department of Computer Engineering
Bachelor of Technology (Computer Engineering), Semester III
Subject: Quantum Computing

Assignment (Lecture 1

5th October 2024

1. What is the main difference between classical bits and quantum bits?
   A. Classical bits can only be in two states, while quantum bits can be in three states.
   B. Classical bits assume states of 0 or 1, while quantum bits can be in a superimposed state.
   C. Quantum bits use real numbers, while classical bits use binary.
   D. Classical bits use the Bloch sphere for representation

2. In a superimposed state, what quantum states satisfy that
   A. $\alpha + \beta = 0$
   B. $\alpha^2 + \beta^=1$
   C. $|\alpha|^2 + |\beta|^2 = 1$
   D. $\alpha^2 = \beta$

3. What does the Bloch Sphere represent in quantum computing?
   A. The energy states of quantum systems.
   B. The possible states of a quantum bit.
   C. The physical implementation of a qubit.
   D. The interaction between qubits

4. Which of the following is an example of a pure quantum state?
   A. $|0\rangle$.
   B. $|1\rangle$.
   C. $\alpha |0\rangle + |1\rangle$.
   D. Both A and B

5. Which of the following points corresponds to the state $|i\rangle$ on the Bloch Sphere (Y-axis)?
   A. (1,0,0)
   B. $(0, 1, 0)$.
   C. (0,0,1).
   D. (0,-1,0)

Short Answer Questions

Define a superimposed state in quantum computing and give an example.

Explain how the Bloch Sphere visualizes a quantum bit.

If a qubit is in the state $\frac{1}{\sqrt{2}}(|0\rangle + |1\rangle)$ what is its corresponding point on the X-axis of the Bloch Sphere?

Compare the difference between pure and superimposed states using real-world examples .

What is the significance of the condition $|\alpha|^2 + |\beta|^2 = 1$