Dr. Babasaheb Ambedkar Technological University
Department of Computer Engineering
Bachelor of Technology (Computer Engineering), Semester III
Subject: Quantum Computing

Assignment (CA2)

5th October 2024

1   Draw a Bloch sphere and denote the following states upon it $|0\rangle$, $|1\rangle$, $|i\rangle$, $|-i\rangle$, $|+\rangle$, and $|-\rangle$,

2   Write the following states as superposition of $|0\rangle$, and $|1\rangle$.
(1) $|i\rangle$, and $|-i\rangle$, (2) $|+\rangle$, and $|-\rangle$

3   What is the difference between global and relative phase shift in quantum computing

4   A qubit is the state
$$\frac{2}{3}|0\rangle + \frac{1+2i}{3}|1\rangle$$

You measure the qubit and get $|0\rangle$. If you measure the qubit a second time, what is the probability of getting -
(a) $|0\rangle$
(b) $|1\rangle$

5.   A qubit is in the state $|0\rangle$. If you measure it in the X-basis $\{|+\rangle, |-\rangle\}$ and then measure it again in the Z-basis $\{|0\rangle, |1\rangle\}$, what is the probability of getting
(a) $|0\rangle$? (b) $|1\rangle$?

6.   What is the Controlled Z gate as a matrix?