QUIZ - 4

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Graded Quiz • 30 min

Congratulations! You passed!

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1. Answer [O, X] — 1 point

Quantum computation can be realized by concatenating CNOT gates and single-qubit gates.

- (O) O
- ( ) X

2. Let U_f denote a function evaluation $U_f|x\rangle|y\rangle = |x\rangle|y + f(x)\rangle$ for $x, y \in \{0, 1\}$. Compute $U_f|x\rangle|-\rangle$. — 1 point

- ( ) (a) $|x\rangle|-\rangle$
- (•) (b) $(-1)^{f(x)}|x\rangle|-\rangle$
- ( ) (c) $|x\rangle|+\rangle$

3. Let U_f with a constant function $f : \{0, 1\} \to \{0, 1\}$ denote a function evaluation $U_f|x\rangle|y\rangle = |x\rangle|y + f(x)\rangle$ for $x, y \in \{0, 1\}$. Which of the followings can be U_f? — 1 point

- (•) (a) $I \otimes I$
- ( ) (b) $I \otimes Z$
- ( ) (c) $X \otimes Z$

4. Consider two unitary transformations $I \otimes I$ and U_{CNOT}. What is the highest success probability of discriminating between the transformations? — 1 point

- ( ) (a) 0
- ( ) (b) $1/2$
- (•) (c) 1

5. Compute the following for $\alpha, \beta \in \{0, \cdots, N-1\}$ and $\alpha \neq \beta$, — 1 point

$\frac{1}{N}\sum_{k=0}^{N-1} \exp[\frac{2\pi i}{N} k(\alpha - \beta)]$.

- (•) (a) 0
- ( ) (b) $1/2$
- ( ) (c) 1

***** Extra question: *****

The Deutsch algorithm is more efficient than its classical counterpart.

Ans: O