Quiz- QPE, Order finding, Shor Results for SevdanurGenc

ⓘ Correct answers are hidden.

Score for this attempt: **10.67** out of 20

Submitted Jun 13 at 12:43am

This attempt took 16 minutes.

Partial

Question 1

0.67 / 2 pts

[D03-03] Select the steps of the QPE algorithm.

- [ ] Initialize first register as the eigenvector of the operator U.
- [ ] Apply CU^k operator where the target is the second register.
- [x] Apply X gates to the all qubits in the first register.
- [x] Apply Hadamard gate to the first register.
- [x] Apply inverse QFT to the first register.

Question 2

2 / 2 pts

[D03-08] How do you initialize the second register in QPE?

- (•) It is initialized as the eigenvector of the operator U.
- ( ) We leave qubits in the second register in 0 state.
- ( ) We apply H to each qubit in the second register.
- ( ) We apply X and H to each qubit in the second register.

Question 3

2 / 2 pts

[D03-01] Select the eigenvectors and the corresponding eigenvalues of the Z operator.

- [x] |0⟩ with eigenvalue 1
- [ ] |-⟩ with eigenvalue 1
- [x] |1⟩ with eigenvalue -1
- [ ] |0⟩ with eigenvalue -1
- [ ] |+⟩ with eigenvalue -1

Question 4

2 / 2 pts

[D03-05] If $t = 3$ and the quantum state that is measured most frequently is |101⟩, what is the estimate for ϕ ?

- (•) 5/8
- ( ) 5
- ( ) 5/16
- ( ) 7/8

Incorrect

Question 5

0 / 2 pts

[D04-01] Let x=4 and N=81. What is r ? (You can compute in Python)

4

Incorrect

Question 6

0 / 2 pts

[D04-02] Select the true statements.

- [ ] If U_x is the operator which maps $U_x|y\rangle \rightarrow |xy \mod N\rangle$ where $x < N$ are relatively prime, its eigenvalues are of the form $e^{\frac{2\pi is}{r}}$.
- [x] We need continued fractions algorithm to extract r out of the estimate for s/r.
- [ ] The second register is initialized as |1⟩ in the order finding algorithm.
- [ ] Modular exponentiation is the name of the procedure in which the powers of the operator CU are computed.
- [x] At the end of the order finding algorithm, we measure r in the first register.
- [x] When s and r are not relatively prime, the algorithm needs to be repated.
- [ ] Order finding has no use in practice since we don't know how to prepare the eigenvector.

Question 7

2 / 2 pts

[D04-03] Given the continued fraction expression [1,4,2,1] write one of the convergents. (Do not leave any space e.g. write 3/2 instead of 3 / 2)

16/13

Question 8

2 / 2 pts

[D05-01] Select the true statements.

- [ ] It is proven that no classical algorithm solves the factoriazation problem in polynomial time.
- [x] The main advantage of Shor's algorithm is the ability to compute r efficiently.
- [x] If r is not even, then one should pick a new x and repeat the algorithm.
- [ ] Shor's algorithm provides quadratic speedup compared to the best known classical algorithm.

Incorrect

Question 9

0 / 2 pts

[D05-02] If the quantum state before applying the inverse QFT is the the following state,

$$\frac{1}{\sqrt{2^9}}\left(|0\rangle|1\rangle+|1\rangle|3\rangle+|2\rangle|9\rangle+|3\rangle|7\rangle+|4\rangle|1\rangle+|5\rangle|3\rangle+|6\rangle|9\rangle+\ldots+|2\right.$$

what is r ?

8

Unanswered

Question 10

0 / 2 pts

[D06-01] If at the end of the Shor's algorithm, the probability of observing state $|k\rangle$ is given by $\left|\frac{1}{\sqrt{85\cdot 512}}\sum_{x=0}^{84} e^{-\frac{2\pi i(6x+2)k}{512}}\right|^2$, write down a state (except 0 and 256) which is likely to be observed with high probability. (Write it as a decimal number, e.g. 34)

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