Unit 5 - Week 3 - Quantum Algorithms

Assignment - 3

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-08-21, 23:59 IST.

1) Deutsch-Jozsa (DJ) algorithm assumes that we are given *1 point*

- a system with discrete energy level
- a black box quantum computer known as an oracle that implements some function
- a system with restricted motion
- all the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
a black box quantum computer known as an oracle that implements some function

2) For the implementation of DJ, the function takes n-digit binary values as input and *1 point*

- produce either a 0 or a 1 as output for each such value
- produced minimized result
- produce a series of numbers that results in the solution
- produced minimized result

No, the answer is incorrect.
Score: 0
Accepted Answers:
produce either a 0 or a 1 as output for each such value

3) When we implement DJ algorithm on a function , it results the fact the function is constant when *1 point*

- returns 0 for all the inputs
- returns 1 for all the inputs
- returns 1 for half of the inputs and 0 for the other half
- the results for all input is either 0 on all outputs or 1 on all outputs

No, the answer is incorrect.
Score: 0
Accepted Answers:
the results for all input is either 0 on all outputs or 1 on all outputs

4) The Walsh-Hadamard transform is a single-qubit operation, denoted by H, and performs the transformation: *1 point*

- $|0\rangle \to \frac{1}{\sqrt{2}}(|0\rangle + |1\rangle)$ and $|1\rangle \to \frac{1}{\sqrt{2}}(|0\rangle + |1\rangle)$
- $|0\rangle \to \frac{1}{\sqrt{2}}(|0\rangle + |1\rangle)$ and $|1\rangle \to \frac{1}{\sqrt{2}}(|0\rangle - |1\rangle)$
- $|0\rangle \to \frac{1}{\sqrt{2}}(|0\rangle + |1\rangle)$
- $|1\rangle \to \frac{1}{\sqrt{2}}(|0\rangle - |1\rangle)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$|0\rangle \to \frac{1}{\sqrt{2}}(|0\rangle + |1\rangle)$ and $|1\rangle \to \frac{1}{\sqrt{2}}(|0\rangle - |1\rangle)$

5) If we let the standard basis as $|0\rangle \to \begin{pmatrix}1\\0\end{pmatrix}$ and $|1\rangle \to \begin{pmatrix}0\\1\end{pmatrix}$, then the corresponding Hadamard basis would be: *1 point*

- same as before
- $\begin{pmatrix}1\\1\end{pmatrix}$ and $\begin{pmatrix}1\\-1\end{pmatrix}$
- $\begin{pmatrix}0\\1\end{pmatrix}$ and $\begin{pmatrix}1\\0\end{pmatrix}$
- $\begin{pmatrix}0\\1\end{pmatrix}$ and $\begin{pmatrix}-1\\0\end{pmatrix}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\begin{pmatrix}1\\1\end{pmatrix}$ and $\begin{pmatrix}1\\-1\end{pmatrix}$

6) If a CNOT gate is applied to the standard basis and its Hadamard basis, the following is true: *1 point*

- There is no connection to the two instances of the CNOT gate
- CNOT gate would be the same in both the standard basis and the Hadamard basis
- CNOT gate would be the same with the control and target qubits swapped in the Hadamard basis
- In the Hadamard basis, CNOT gate cannot operate

No, the answer is incorrect.
Score: 0
Accepted Answers:
CNOT gate would be the same with the control and target qubits swapped in the Hadamard basis

7) How can one define an 'Oracle'? *1 point*

- Oracle is just a 'black box' that you can canot see its inside, and hence you don't know what it is actually doing and it is an operation that has some property that you don't know, and are trying to find out
- Oracle is such an object of which all you know is that you can supply inputs and receive outputs
- Oracle can be written in any valid form that defines a map from all possible inputs to outputs
- All of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
All of the above

8) Unlike Shor's quantum algorithm that provide exponential speedup over their classical counterparts, Grover's algorithm *0 points*

- provides only a quadratic speedup
- is probabilistic in the sense that it gives the correct answer with a probability of less than 1
- is asymptotically optimal
- All of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
All of the above

9) Grover's algorithm is best known for efficiently *1 point*

- searching an unstructured database and may be more accurate to describe it as "inverting a function"
- searching an structured database and may be more accurate to describe it as determining balanced function
- determing whether any given function is biased or balanced
- breaking public-key cryptography schemes

No, the answer is incorrect.
Score: 0
Accepted Answers:
searching an unstructured database and may be more accurate to describe it as "inverting a function"

10) Shor's algorithm is not a pure quantum algorithm but is a hybrid of classical and quantum process to achieve prime factorization of a given number with an exponential speedup over classical counterparts. The efficiency of Shor's algorithm is due to the efficiency of *0 points*

- a quantum algorithm to solve the order-finding problem that involves quantum Fourier transform and modular exponentiation by repeated squarings
- the extremely fast and efficient random number generation process
- the reduction of the factoring problem to the problem of order-finding
- All of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
the extremely fast and efficient random number generation process