Unit 14 - Week - 12 - An Overview of the Implementation of Quantum Computing

Assignment-12

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

Due on 2019-10-23, 23:59 IST.

1) Which of the following concept is explained by the decay processes that are both exponential and oscillatory for time? *1 point*

- Fidelity of stored quantum information decay.
- Stored quantum information does not decay with time.
- Fidelity of stored quantum information grows in an oscillatory manner.
- Transverse or phase relaxation of the decay timescale is the only dependence of quantum information on time.

No, the answer is incorrect.
Score: 0
Accepted Answers:
Fidelity of stored quantum information decay.

2) Given a qubit $|\psi\rangle = a|0\rangle + b|1\rangle$, where $a^2 + b^2 = 1$ and with only a single measurement device, how many copies of $|\psi\rangle$ are required to recover the full information of the state? *1 point*

- One needs two copies
- One requires infinite copies
- As there is only one measurement device, one can only ever get values of $|b|^2$
- One requires 2^n copies, where n is the number of ancillary qubits required to encode the state $|\psi\rangle$

No, the answer is incorrect.
Score: 0
Accepted Answers:
As there is only one measurement device, one can only ever get values of $|b|^2$

3) Consider the following property of an operator: $U|\psi\rangle \otimes |\phi\rangle = |\psi\rangle \otimes |\psi\rangle$. Which of the following statements are true? *1 point*

- Such an operator may exist
- Such an operator violates the no cloning theorem and is thus impossible
- Such an operator does violate the no cloning theorem but may be implemented practically
- Such an operator cannot exist as it violates the Bell inequality

No, the answer is incorrect.
Score: 0
Accepted Answers:
Such an operator violates the no cloning theorem and is thus impossible

4) Which algorithm of Quantum Computing is considered to violate the strong version of the Church-Turing thesis, i.e., "any computational model can be simulated on a probabilistic Turing machine with at most a polynomial increase in the number of computational steps"? *1 point*

- Grover's algorithm, as search in an unsorted array is a non-polynomial time problem
- Deustch-Josza algorithm
- No quantum algorithm is considered to be a possible candidate to violate the strong Church-Turing thesis
- Shor's algorithm, as experience has suggested that factorization is intractable (in terms of the number of instructions required to solve the problem compared to the number of bits to measure the problem)

No, the answer is incorrect.
Score: 0
Accepted Answers:
Shor's algorithm, as experience has suggested that factorization is intractable (in terms of the number of instructions required to solve the problem compared to the number of bits to measure the problem)

5) If we consider the interaction between qubits to be introduced by external effects (such as ion traps) and we consider the qubit interactions for NMR to be internal (always present between spins) what is the main methodology to work with such systems? *1 point*

- The rotation effected by the intrinsic interactions is larger (by about two orders of magnitude) than the time need needed for a radiofrequency field to rotate an individual qubit
- We are able to freeze all other atoms and suppress completely, the intrinsic interactions by cooling techniques
- Machine learning modeling is used to suppress the noise and false results due to the intrinsic interactions
- NMR quantum computing does not use any external field at all, and the systems are tailored chemically to implement quantum computations

No, the answer is incorrect.
Score: 0
Accepted Answers:
The rotation effected by the intrinsic interactions is larger (by about two orders of magnitude) than the time need needed for a radiofrequency field to rotate an individual qubit

6) The interaction of two states with the imaginary part of an interaction term is: *1 point*

- Desorption due to Rabi oscillations and describes excitation in a three-level system
- Absorption due to Raleigh absorption in a two-level system
- Absorption due to Rabi flopping and describes resonant excitation in a two-level system
- Desorption due to Rabi flopping and off-resonant excitation in a two-level system

No, the answer is incorrect.
Score: 0
Accepted Answers:
Absorption due to Rabi flopping and describes resonant excitation in a two-level system

7) For the theoretical treatment of two-level systems, the interactions with an applied laser pulse are taken to be: *1 point*

- Isothermal
- Isobaric
- Isochoric
- Adiabatic

No, the answer is incorrect.
Score: 0
Accepted Answers:
Adiabatic

8) What do superconducting flux materials and NMR computing have in common? *1 point*

- They are both defunct methods
- They both use spins as qubit materials
- There are no similarities
- They both are not scalable

No, the answer is incorrect.
Score: 0
Accepted Answers:
They both use spins as qubit materials

9) Experiments on molecular fragmentation have led to the understanding that: *1 point*

- The simultaneous effect of chirp and polarization are mutually exclusive control knobs to be used as qubits
- Only where the Frank-Codon principle holds, can these molecular beams be used for qubits
- The simultaneous interaction of chirp and polarization are essentially a single control knob for qubits
- The molecular fragmentation process is completely independent of chirp and polarization

No, the answer is incorrect.
Score: 0
Accepted Answers:
The simultaneous interaction of chirp and polarization are essentially a single control knob for qubits

10) For flux qubits, the readout is complicated due to decoherence induced by the readout device and is thus performed by: *1 point*

- A thermocouple sensor
- An NMR ensemble of designer molecules
- A digital manometer
- A SQUID

No, the answer is incorrect.
Score: 0
Accepted Answers:
A SQUID