Quiz #2

Total points 8/10

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✕ Select correct answer for all the problems. * /1

For the following 10 problems given:

$$|0> = \begin{bmatrix} 0 \\ 1 \end{bmatrix} and |1> = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

Bell States:

$$|B1> = \frac{1}{\sqrt{2}} (|00> + |11>), |B2> = \frac{1}{\sqrt{2}} (|00> - |11>$$

$$|B3> = \frac{1}{\sqrt{2}} (|01> + |10>), |B4> = \frac{1}{\sqrt{2}} (|01> - |10>$$

1) On expressing $\frac{1}{\sqrt{2}} (|01> + i |10>)$ in terms of the Bell States, the coefficients of B1 and B2 are:

- 0 , 0
- 0, 1
- 1, 0
- 1, 1

Correct answer

- 0 , 0

✓ 2) Operator corresponding to |0><1| + |1><0| is: * /1

$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Option 1

$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

Option 2

$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

Option 3

$\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$

Option 4

✓ 3) The eigenvalues of |0><0| + |1><1| are: * /1

- 0, 0
- 0, 1
- 1, 0
- 1, -1

✓ *

/1

(4)The dimension of the matrix |0>|0>|0>|0> is $(a \times b)$. *Then a and b a* :

- 4, 1
- 8, 1
- 16, 1
- 32, 1

✓ 5) *

/1

$$A = \alpha \begin{bmatrix} 1 & 1 \\ i & 1 \end{bmatrix} \text{ is unitary for some value of } \alpha$$

1. True
2. False

✓ 6) *

1

Given the two-qubit state $|\psi> = \frac{1}{\sqrt{2}}\begin{bmatrix}0\\1\\0\\1\end{bmatrix}$, if the state of the first qubit is $\frac{1}{\sqrt{2}}\begin{bmatrix}1\\1\end{bmatrix}$, the state of the second qubit is:

$\begin{bmatrix}1\\0\end{bmatrix}$

Option 1

$\begin{bmatrix}0\\1\end{bmatrix}$

Option 2

$\frac{1}{\sqrt{2}}\begin{bmatrix}1\\1\end{bmatrix}$

Option 3

$\frac{1}{\sqrt{2}}\begin{bmatrix}1\\-1\end{bmatrix}$

Option 4

✗ *

7) If the inner product between two single-qubit states $|\psi\rangle$ and $|\phi\rangle$ is found to be 0.4. Then the inner product between $\hat{A}|\psi\rangle$ and $\hat{A}|\phi\rangle$, where $\hat{A} = |0\rangle\langle 0| - |1\rangle\langle 1|$,

- 0
- 0.6
- 0.4
- 0.16

Correct answer

- 0.4

✓ *

8) If $|\psi\rangle = 1/2\ (\ |00\rangle + |01\rangle + |10\rangle + 11\rangle$, what is the probability of the first qubit to be in $|0\rangle$ state when the second qubit is measured to be is $|0\rangle$ or $|1\rangle$?

- 0
- 1/4
- 1/2
- 3/4

*

9) Given three quantum gates:

$$Z = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}, H = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \text{ and } X = \begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix},$$

What is $ZHX|0>$?

- Option 1: $\frac{1}{\sqrt{2}} \begin{bmatrix} i \\ -i \end{bmatrix}$
- Option 2: $\frac{1}{\sqrt{2}} \begin{bmatrix} i \\ i \end{bmatrix}$
- Option 3: $\frac{1}{\sqrt{2}} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$
- Option 4: $\frac{1}{\sqrt{2}} \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

/1

10) The observables $\hat{O}_1 = |0><0| - 2|1><1|$ and $\hat{O}_2 = 2|0><0| - |1><1|$ are measured successively on the state $1/\sqrt{2}(|0> + |1>)$. If a measurement of $\hat{O}_1$ gives the experimental result as 1, then the experimental result on measurement of $\hat{O}_2$ on the resultant state is:

1. 1
2. 2