Homework Quiz - Week 14 Results for Murshed SK

Correct answers are hidden.

Score for this attempt: 10 out of 10

Submitted Feb 1 at 8:33am

This attempt took less than 1 minute.

Question 1

1 / 1 pts

If a qubit is in the state $\begin{bmatrix}1\\0\end{bmatrix}$, what is the result of applying the Hadamard gate to it?

a. $|+\rangle$

b. $|-\rangle$

c. $|-+\rangle$

d. $\begin{bmatrix}-\\+\end{bmatrix}$

e. $\begin{bmatrix}0\\0\end{bmatrix}$

- (•) A
- ( ) B
- ( ) C
- ( ) D
- ( ) E

Question 2

1 / 1 pts

Is the tensor product of $\begin{bmatrix}0\\1\end{bmatrix}$ and $\begin{bmatrix}0\\1\end{bmatrix}$ the same as the tensor product of $\begin{bmatrix}0\\1\end{bmatrix}$ and $\begin{bmatrix}1\\0\end{bmatrix}$?

- ( ) Yes, because the qubits are the same.
- ( ) No, because the qubits are different.
- (•) No, because the qubits are in a different state.
- ( ) Yes, because even though the qubits are different, they will give the same result.
- ( ) No, because this is an entangled state and the tensor product cannot be used here.

Question 3

1 / 1 pts

What is the tensor product of these two qubit states: $\begin{bmatrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{bmatrix}$ and $\begin{bmatrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{bmatrix}$?

a. $\frac{\mathbf{1}}{\sqrt{\mathbf{2}}} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$

b. $\frac{\mathbf{1}}{\mathbf{2}} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$

c. $\frac{\mathbf{1}}{\mathbf{4}} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$

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

e. These two states are entangled, so we cannot represent them using tensor products.

- A
- B
- C
- D
- E

Question 4

1 / 1 pts

What is the probability of measuring $|\mathbf{01}\rangle$ in this quantum system: $\begin{bmatrix} \frac{\sqrt{3}}{2} \\ 0 \\ \frac{1}{2} \\ 0 \end{bmatrix}$?

a. $\frac{\sqrt{3}}{2}$
b. $\frac{3}{4}$
c. 0
d. $\frac{1}{2}$
e. $\frac{3}{4}$

- A
- B
- C
- D
- E

Question 5
1 / 1 pts

What is the probability of measuring $|00\rangle$ in this quantum system: $\sqrt{\frac{1}{3}}|00\rangle + \sqrt{\frac{1}{6}}|01\rangle + \sqrt{\frac{1}{3}}|10\rangle + \sqrt{\frac{1}{6}}|11\rangle\rangle$?

a. $\sqrt{\frac{1}{3}}$
b. $\frac{1}{3}$
c. $\sqrt{\frac{1}{6}}$
d. $\frac{1}{6}$
e. $\frac{2}{3}$

- A
- B
- C
- D
- E

Question 6
1 / 1 pts

What is the tensor product of these two qubit states: $\begin{bmatrix} \sqrt{\frac{2}{3}} \\ \sqrt{\frac{1}{3}} \end{bmatrix}$ and $\begin{bmatrix} \sqrt{\frac{1}{3}} \\ \sqrt{\frac{2}{3}} \end{bmatrix}$?

a. $\begin{bmatrix} \sqrt{\frac{2}{3}} \\ \frac{2}{3} \\ \frac{\sqrt{2}}{3} \\ \frac{1}{3} \end{bmatrix}$

b. $\begin{bmatrix} \sqrt{\frac{\sqrt{2}}{3}} \\ \frac{1}{3} \\ \frac{2}{3} \\ \frac{\sqrt{2}}{3} \end{bmatrix}$

c. $\begin{bmatrix} \sqrt{\frac{2}{9}} \\ \frac{4}{9} \\ \frac{1}{9} \\ \frac{2}{9} \end{bmatrix}$

d. $\begin{bmatrix} \frac{\sqrt{2}}{3} \\ \frac{2}{3} \\ \frac{1}{3} \\ \frac{\sqrt{2}}{3} \end{bmatrix}$

e. These two states are entangled, so we cannot represent them using tensor products.

- A
- B
- C
- D
- E

Question 7

1 / 1 pts

7. Given the quantum state $\begin{bmatrix} 0 \\ \frac{1}{\sqrt{2}} \\ 0 \\ -\frac{1}{\sqrt{2}} \end{bmatrix}$, if we apply the X gate to the second qubit, what is the new state?

a. $\begin{bmatrix} \frac{1}{\sqrt{2}} \\ 0 \\ \frac{-1}{\sqrt{2}} \\ 0 \end{bmatrix}$

b. $\begin{bmatrix} \frac{1}{\sqrt{2}} \\ 0 \\ 0 \\ \frac{-1}{\sqrt{2}} \end{bmatrix}$

c. $\begin{bmatrix} \frac{1}{\sqrt{2}} \\ 0 \\ 0 \\ \frac{1}{\sqrt{2}} \end{bmatrix}$

d. $\begin{bmatrix} 0 \\ 0 \\ -1 \\ 0 \end{bmatrix}$

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

- (●) A
- ( ) B
- ( ) C
- ( ) D
- ( ) E

Question 8

1 / 1 pts

Consider the quantum state $|\mathbf{101}\rangle$. If we apply the CNOT gate to the first (leftmost) qubit (control) and the second (middle) qubit (target), what is the resulting state?

a. $|\mathbf{101}\rangle$
b. $|\mathbf{111}\rangle$
c. $|\mathbf{100}\rangle$
d. $|\mathbf{001}\rangle$
e. $|\mathbf{110}\rangle$

- ( ) A
- (●) B
- ( ) C

D

E

Question 9

1 / 1 pts

If a collection of qubits are in the state below,, how many qubits are there?

$$\begin{bmatrix} \frac{1}{\sqrt{3}} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ \frac{1}{\sqrt{3}} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ \frac{1}{\sqrt{3}} \\ 0 \end{bmatrix}$$

3

4

5

6

Impossible to tell

Question 10
1 / 1 pts

Which of the following states are non-separable?

a. $(|+\rangle)$
b. $(|\mathbf{01}\rangle)$
c. $\frac{\mathbf{1}}{\sqrt{\mathbf{2}}}(|\mathbf{00}+\mathbf{0}\rangle+|\mathbf{00}-\mathbf{0}\rangle)$
d. $\frac{\mathbf{1}}{\sqrt{\mathbf{2}}}(|\mathbf{0}-+\mathbf{0}\rangle+|\mathbf{0}+-\mathbf{0}\rangle)$
e. $\frac{\mathbf{1}}{\sqrt{\mathbf{3}}}(|+\mathbf{0}\rangle+|-\mathbf{0}\rangle+|\mathbf{00}\rangle)$

- A
- B
- C
- D
- E

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