Quiz-1-solution

Q : Use Bra-ket notation to write the following.

$$\begin{bmatrix} \frac{i}{\sqrt{6}} \\ 0 \\ \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{3}} \end{bmatrix}$$

Solution:

$$\begin{bmatrix} \frac{i}{\sqrt{6}} \\ 0 \\ \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{3}} \end{bmatrix} = \frac{i}{\sqrt{6}} |00\rangle + \frac{1}{\sqrt{2}} |10\rangle + \frac{1}{\sqrt{3}} |11\rangle$$

Q : Given qubits $|\psi\rangle = \frac{i}{\sqrt{7}} |00000\rangle + \sqrt{\frac{3}{7}} |00011\rangle + \sqrt{\frac{2}{7}} |00111\rangle + \frac{1}{\sqrt{7}} |01111\rangle$

a) With what probability we can measure first two qubits as 00. b) What will be the resultant state after measurement.

Solution:

$Probability = |\frac{i}{\sqrt{7}}|^2 + |\sqrt{\frac{3}{7}}|^2 + |\sqrt{\frac{2}{7}}|^2 = \frac{1}{7} + \frac{3}{7} + \frac{2}{7} = \frac{6}{7}$

$Resultant : |\psi\rangle = \frac{i}{\sqrt{6}} |00000\rangle + \sqrt{\frac{1}{2}} |00011\rangle + \sqrt{\frac{1}{3}} |00111\rangle$

Quiz-1

Q : Use Bra-ket notation to write the following.

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 12 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 13 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 19 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 17 & 0 \end{bmatrix}$$

Solution:

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 12 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 13 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 19 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 17 & 0 \end{bmatrix} = |010\rangle \langle 010| 12 + |011\rangle \langle 011| 13 + |110\rangle \langle 000| 19 + |111\rangle \langle 110| 17$$

Q : Given qubits $|\psi\rangle = \frac{i}{\sqrt{7}} |00000\rangle + \sqrt{\frac{3}{7}} |00011\rangle + \sqrt{\frac{2}{7}} |00111\rangle + \frac{1}{\sqrt{7}} |01111\rangle$

a) With what probability we can measure the first three qubits as 000. b) What will be the resultant state after measurement.

Solution:

$Probability : |\frac{i}{\sqrt{7}}|^2 + |\sqrt{\frac{3}{7}}|^2 = \frac{1}{7} + \frac{3}{7} = \frac{4}{7}$

$Resultant : |\psi\rangle = \frac{i}{\sqrt{4}} |00000\rangle + \sqrt{\frac{3}{4}} |00011\rangle$

Quiz-1

Q : Use Bra-ket notation to write the following.

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

Solution:

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} = |00\rangle\langle 00| + |01\rangle\langle 01| + |10\rangle\langle 10| + |11\rangle\langle 11|$$

Q : Given qubits $|\psi\rangle = \frac{i}{\sqrt{7}}|00000\rangle + \sqrt{\frac{3}{7}}|00011\rangle + \sqrt{\frac{2}{7}}|00111\rangle + \frac{1}{\sqrt{7}}|01111\rangle$

a) With what probability we can measure third last qubit as 0. b) What will be the resultant state after measurement

$Probability : |\frac{i}{\sqrt{7}}|^2 + |\sqrt{\frac{3}{7}}|^2 = \frac{1}{7} + \frac{3}{7} = \frac{4}{7}$

$Resultant : |\psi\rangle = \frac{i}{\sqrt{4}}|00000\rangle + \sqrt{\frac{3}{4}}|00011\rangle$

Quiz-1

Q : Use Bra-ket notation to write the following.

$$\begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 3 & 0 & 0 & 9 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Solution:

$$\begin{bmatrix} 2 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 3 & 0 & 0 & 9 \\ 0 & 0 & 0 & 0 \end{bmatrix} = 2\,|00\rangle\langle 00| + |01\rangle\langle 01| + 3\,|10\rangle\langle 00| + 9\,|10\rangle\langle 11|$$

Q : Given qubits $|\psi\rangle = \frac{i}{\sqrt{7}}\,|00000\rangle + \sqrt{\frac{3}{7}}\,|00011\rangle + \sqrt{\frac{2}{7}}\,|00111\rangle + \frac{1}{\sqrt{7}}\,|01111\rangle$

a) With what probability we can measure third last qubit as 1. b) What will be the resultant state after measurement.

Solution:

$Probability$: $|\sqrt{\frac{2}{7}}|^2 + |\frac{1}{\sqrt{7}}|^2 = \frac{2}{7} + \frac{1}{7} = \frac{3}{7}$

$Resultant$: $\sqrt{\frac{2}{3}}\,|00111\rangle + \frac{1}{\sqrt{3}}\,|01111\rangle$

Quiz-1

Q : Use Bra-ket notation to write the following.

$$\begin{bmatrix} \frac{i}{\sqrt{6}} & 0 & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{3}} \end{bmatrix}$$

Solution:

$$\begin{bmatrix} \frac{i}{\sqrt{6}} & 0 & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{3}} \end{bmatrix} = \langle 00| \frac{i}{\sqrt{6}} + \langle 10| \frac{1}{\sqrt{2}} + \langle 11| \frac{1}{\sqrt{3}}$$

Q : Given qubits $|\psi\rangle = \frac{i}{\sqrt{7}} |00000\rangle + \sqrt{\frac{3}{7}} |00011\rangle + \sqrt{\frac{2}{7}} |00111\rangle + \frac{1}{\sqrt{7}} |01111\rangle$

a) With what probability we can measure the second last qubit as 1. b) What will be the resultant state after measurement.

$Probability : |\sqrt{\frac{3}{7}}|^2 + |\sqrt{\frac{2}{7}}|^2 + |\frac{1}{\sqrt{7}}|^2 = \frac{6}{7}$

$Resultant : |\psi\rangle = \sqrt{\frac{1}{2}} |00011\rangle + \sqrt{\frac{1}{3}} |00111\rangle + \frac{1}{\sqrt{6}} |01111\rangle$

Quiz-1

Q : Use Bra-ket notation to write the following.

$$\begin{bmatrix} 12 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 13 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 19 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 17 & 0 & 0 & 0 \end{bmatrix}$$

Solution:

$$\begin{bmatrix} 12 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 13 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 19 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 17 & 0 & 0 & 0 \end{bmatrix} = 12\,|000\rangle\langle 000| + 13\,|011\rangle\langle 011| + 19\,|101\rangle\langle 110| + 17\,|111\rangle\langle 100|$$

Q : Given qubits $|\psi\rangle = \frac{i}{\sqrt{7}}\,|00000\rangle + \sqrt{\frac{3}{7}}\,|00011\rangle + \sqrt{\frac{2}{7}}\,|00111\rangle + \frac{1}{\sqrt{7}}\,|01111\rangle$

a) With what probability we can measure the middle qubit as 1. b) What will be the resultant state after measurement.

Solution:

$Probability : |\sqrt{\frac{2}{7}}|^2 + |\frac{1}{\sqrt{7}}|^2 = \frac{2}{7} + \frac{1}{7} = \frac{3}{7}$

$Resultant : |\psi\rangle = \sqrt{\frac{2}{3}}\,|00111\rangle + \frac{1}{\sqrt{3}}\,|01111\rangle$

Quiz-1

Q : Use Bra-ket notation to write the following.

$$\begin{bmatrix} 7 & 0 & 0 & \frac{1}{\sqrt{3}} & 0 & 14 & 0 & 22 \end{bmatrix}$$

Solution:

$$\begin{bmatrix} 7 & 0 & 0 & \frac{1}{\sqrt{3}} & 0 & 14 & 0 & 22 \end{bmatrix} = 7\langle 000| + \frac{1}{\sqrt{3}}\langle 011| + 14\langle 101| + 22\langle 111|$$

Q : Given qubits $|\psi\rangle = \frac{i}{\sqrt{7}}|00000\rangle + \sqrt{\frac{3}{7}}|00011\rangle + \sqrt{\frac{2}{7}}|00111\rangle + \frac{1}{\sqrt{7}}|01111\rangle$

a) With what probability we can measure last two qubits as 11. b) What will be the resultant state after measurement.

Solution:

$Probability : |\sqrt{\frac{3}{7}}|^2 + |\sqrt{\frac{2}{7}}|^2 + |\frac{1}{\sqrt{7}}|^2 = \frac{6}{7}$

$Resultant : |\psi\rangle = \sqrt{\frac{3}{6}}|00011\rangle + \sqrt{\frac{2}{6}}|00111\rangle + \frac{1}{\sqrt{6}}|01111\rangle$