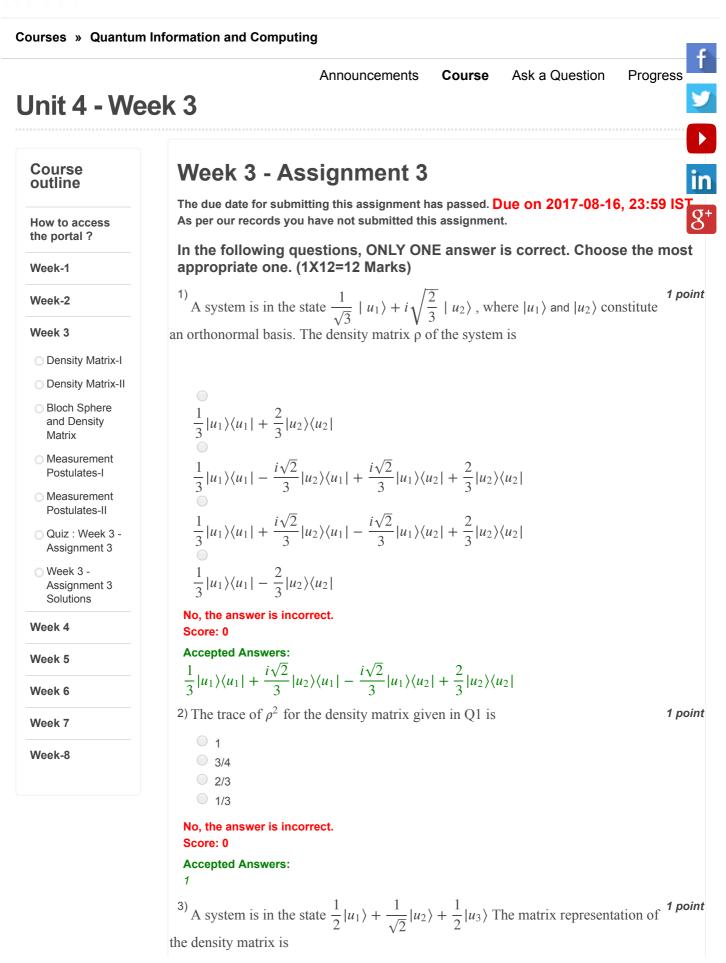
Х





$\begin{pmatrix} \frac{1}{4} \\ \frac{1}{2\sqrt{2}} \\ \frac{1}{2\sqrt{2}} \end{pmatrix}$	$\frac{1}{2\sqrt{2}}$ $\frac{1}{2}$ $\frac{1}{4}$	$\frac{1}{2\sqrt{2}}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$
$ \left(\begin{array}{ccc} \frac{1}{4} & 0 \\ 0 & \frac{1}{2} \\ 0 & 0 \end{array}\right) $	+ /	
$\begin{pmatrix} \frac{1}{4} \\ \frac{1}{4} \\ \frac{1}{2\sqrt{2}} \end{pmatrix}$	$\frac{1}{4}$ $\frac{1}{2}$ $\frac{1}{4}$	$\frac{1}{2\sqrt{2}}$ $\frac{1}{4}$ $\frac{1}{4}$
$\begin{pmatrix} \frac{1}{4} \\ \frac{1}{2\sqrt{2}} \\ \frac{1}{4} \end{pmatrix}$	$\frac{\frac{1}{2\sqrt{2}}}{\frac{1}{2}}$ $\frac{1}{2\sqrt{2}}$	$\frac{\frac{1}{4}}{\frac{1}{2\sqrt{2}}}$ $\frac{1}{4}$

No, the answer is incorrect. Score: 0

**Accepted Answers:** 

$\left(\begin{array}{c} \frac{1}{4} \end{array}\right)$	$\frac{1}{2\sqrt{2}}$	$\left(\frac{1}{4}\right)$
$\frac{1}{2\sqrt{2}}$	$\frac{1}{2}$	$\frac{1}{2\sqrt{2}}$
$\left(\begin{array}{c} \frac{1}{4} \end{array}\right)$	$\frac{1}{2\sqrt{2}}$	$\left(\frac{1}{4}\right)$

4) The density operator  $\rho$  evolves with time following the equation

$$-i\hbar \frac{d\rho}{dt} = [H, \rho]$$
$$i\hbar \frac{d\rho}{dt} = [H, \rho]$$
$$i\hbar \frac{d\rho}{dt} = H\rho$$
$$-i\hbar \frac{d\rho}{dt} = H\rho$$

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



$$i\hbar \frac{d\rho}{dt} = [H, \rho]$$
5) The reduced density matrix for the two qubit entangled state
$$1 \text{ point}$$

$$\frac{00}{\sqrt{2}}, \text{ corresponding to either of the qubits is}$$

$$\frac{I}{\sqrt{2}}, \text{ corresponding to either of the qubits is}$$

$$\frac{I}{\sqrt{2}}, \frac{I}{\sqrt{2}}, \frac{I}{\sqrt{2}},$$

1 point <sup>6)</sup> A two qubit state is given by  $\frac{1}{\sqrt{3}} \left[ |00\rangle + |01\rangle + |10\rangle \right]$ . The reduced density

matrix of the first qubit is

$$\frac{1}{3} \left[ | 0 \rangle \langle 0 | + | 1 \rangle \langle 0 | + | 0 \rangle \langle 1 | + 2 | 1 \rangle \langle 1 | \right]$$
  
$$\frac{1}{2} \left[ | 0 \rangle \langle 0 | + | 1 \rangle \langle 0 | + | 0 \rangle \langle 1 | + | 1 \rangle \langle 1 | \right]$$
  
$$\frac{1}{3} \left[ 2 | 0 \rangle \langle 0 | + | 1 \rangle \langle 0 | + | 0 \rangle \langle 1 | + | 1 \rangle \langle 1 | \right]$$
  
$$\frac{1}{3} \left[ 2 | 0 \rangle \langle 0 | - | 1 \rangle \langle 0 | + | 0 \rangle \langle 1 | + | 1 \rangle \langle 1 | \right]$$

No, the answer is incorrect. Score: 0

#### **Accepted Answers:**

$$\frac{1}{3} \left[ 2 \mid 0 \rangle \langle 0 \mid + \mid 1 \rangle \langle 0 \mid + \mid 0 \rangle \langle 1 \mid + \mid 1 \rangle \langle 1 \mid \right]$$

7) The centre of the Bloch sphere is

- A pure state
- Neither a pure state nor a mixed state

 $\bigcirc$  A mixed state represented by a matrix whose diagonal elements are 1/2 each and the off diagonal elements are 1 each

• A mixed state represented by a diagonal matrix whose elements are 1/2 each

# No, the answer is incorrect.

## Score: 0

**Accepted Answers:** 

A mixed state represented by a diagonal matrix whose elements are 1/2 each

<sup>8)</sup> The matrix 
$$\begin{pmatrix} 1/3 & \sqrt{3}i/2 \\ -\sqrt{3}i/2 & 2/3 \end{pmatrix}$$
 **1** point

1 point

#### Quantum Information and Computing - - Unit 4 - Week 3

- is a valid density matrix for a system and it represents a pure state
- is a valid density matrix for a system and it represents a mixed state
  - is not a valid density matrix since it is not hermitian
  - is not a valid density matrix as it is not a positive matrix

# No, the answer is incorrect. Score: 0

Accepted Answers:

#### is not a valid density matrix as it is not a positive matrix

9) The reduced density matrix corresponding to the first qubit for the state  $\sqrt{3}$  1

$$\frac{\sqrt{3}}{2}|00\rangle + \frac{1}{2}|11\rangle \text{ is given by}$$

$$\frac{1}{4}\begin{pmatrix}3 & 0\\0 & 1\end{pmatrix}$$

$$\frac{1}{4}\begin{pmatrix}1 & 0\\0 & 3\end{pmatrix}$$

$$\frac{1}{\sqrt{3}+1}\begin{pmatrix}\sqrt{3} & 0\\0 & 1\end{pmatrix}$$

$$\frac{1}{\sqrt{3}+1}\begin{pmatrix}1 & 0\\0 & \sqrt{3}\end{pmatrix}$$
No, the answer is incorrect.

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

 $\frac{1}{4} \begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$ 

<sup>10</sup>Consider a two qubit state  $\frac{1}{\sqrt{7}}(|00\rangle + \sqrt{2}|01\rangle + \sqrt{3}|10\rangle + |11\rangle)$  If we measure <sup>1</sup> point the first qubit and obtain  $|0\rangle$ , then the second qubit collapses to

$$\frac{1}{\sqrt{3}} (|0\rangle + \sqrt{2}|1\rangle)$$

$$\frac{1}{\sqrt{3}} (\sqrt{2}|0\rangle + |1\rangle)$$

$$\frac{1}{\sqrt{7}} (|0\rangle + \sqrt{2}|1\rangle)$$

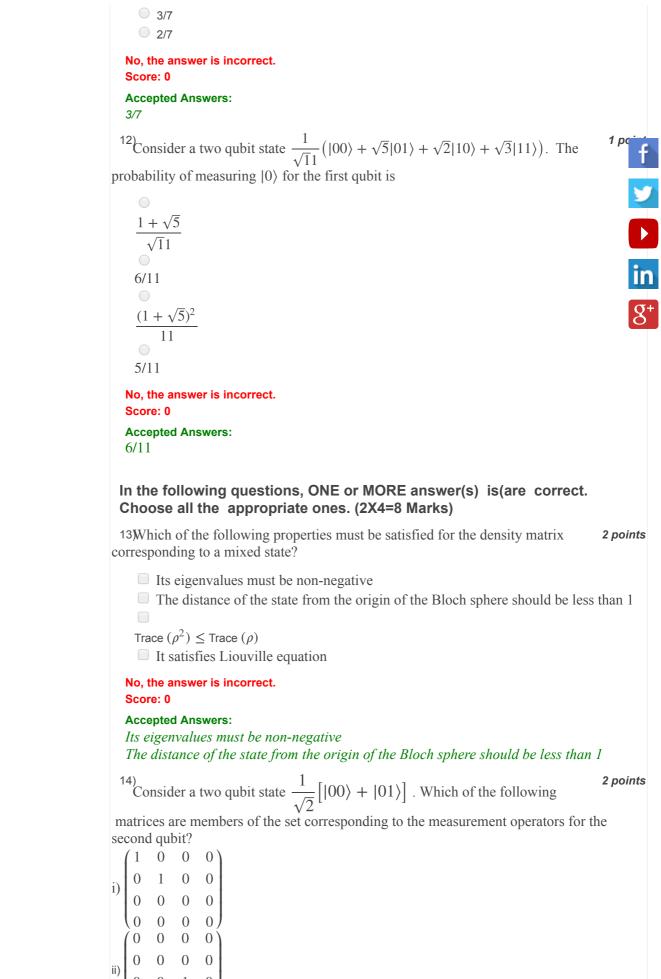
$$\frac{1}{\sqrt{7}} (2|0\rangle + \sqrt{3}|1\rangle)$$

No, the answer is incorrect. Score: 0

Accepted Answers:  $\frac{1}{\sqrt{3}} (|0\rangle + \sqrt{2}|1\rangle)$ 

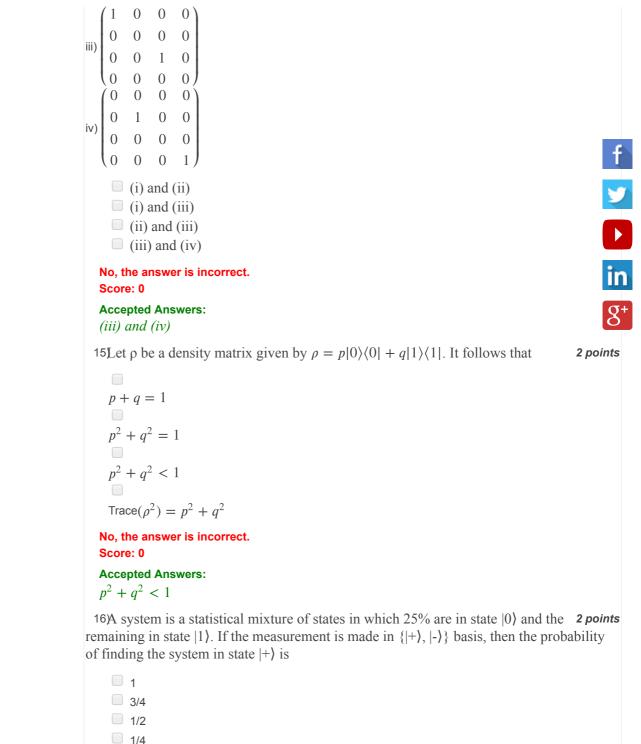
11 Jin Q 10, the probability that a projective measurement of the first qubit gives is **1** point  $|0\rangle$ 

f 1 pc int D



0 1 0

ii)



No, the answer is incorrect.

**Previous Page** 

**Accepted Answers:** 

Score: 0

1/2

End

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