Quiz-II

PH 441

Total Marks 05

- Simply put √ against the correct options
- **Or**, alternatively write down the correct options in a piece of paper and upload it.

More than one option may be correct. Marks will be awarded for fully correct answer only.

1. The density matrix of a system is given as: $\frac{1}{5}\begin{bmatrix}1 & 2\\ 2 & 4\end{bmatrix}$.

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(A) The density matrix represents a pure state.

(B) The density matrix represents a mixed state

(C) The probability that a measurement of the system will find it in state $|0\rangle$ is $1/5$

(D) The expectation value of σ_x in this state is $1/5$.

2. Let a density matrix be represented by $\rho = m|0\rangle\langle 0| + n|1\rangle\langle 1|$. It follows that

1

(A) m+n=1

(B) $m^2+n^2=1$

(C) $(m+n)^2=1$

(D) $\text{trace}(\rho^2) = m^2 + n^2$

3. Consider a two qubit state $\frac{1}{\sqrt{7}}\left(|00\rangle + \sqrt{2}|01\rangle + \sqrt{3}|10\rangle + |11\rangle\right)$. If the first qubit is measured, and we obtain $|0\rangle$, then the second qubit collapses to:

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(A) $\frac{1}{\sqrt{3}}\left[|0\rangle + \sqrt{2}|1\rangle\right]$

(B) $\frac{1}{\sqrt{3}}\left[|1\rangle + \sqrt{2}|0\rangle\right]$

(C) $\frac{1}{\sqrt{7}}\left[|0\rangle + \sqrt{2}|1\rangle\right]$

(D) $\frac{1}{\sqrt{7}}\left[2|0\rangle + \sqrt{3}|1\rangle\right]$