# Quiz 2: Multiple Quantum Systems

**Question 1.** Consider the 2-party state

$$\rho_{AB} = \frac{1}{2}(|00\rangle\langle 00| + |11\rangle\langle 11|).$$

Which of the following describe $\rho_{AB}$?

(A) Pure.

(B) Separable.

(C) Mixed.

(D) Entangled.

**Question 2.** Consider the 2-party state

$$\rho_{AB}\frac{1}{2}(|00\rangle + |11\rangle)(\langle 00| + \langle 11|).$$

Which of the following describe $\rho_{AB}$?

(A) Pure.

(B) Entangled.

(C) Mixed.

(D) Purification of $\frac{1}{2}I_A$.

**Question 3.** Let $\tau_{AB} = |\psi\rangle\langle\psi|$, where

$$|\psi\rangle = \frac{1}{\sqrt{3}}(|01\rangle_{AB} - |00\rangle_{AB} + |11\rangle_{AB}).$$

What is $\tau_A = \mathrm{tr}_B[\tau_{AB}]$?

$$A = |1\rangle\langle 1|, \qquad B = \frac{1}{3}(2|0\rangle\langle 0| + |1\rangle\langle 1| + |0\rangle\langle 1| + |1\rangle\langle 0|),$$

$$C = |1\rangle\langle 1| + |0\rangle\langle 1| + |1\rangle\langle 0|, \qquad D = \frac{1}{3}(|0\rangle\langle 0| + 2|1\rangle\langle 1| - |0\rangle\langle 1| - |1\rangle\langle 0|).$$