

CSEP 590tv In Class Problems, July 20, 2005

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1. Alice has the first qubit of the two qubit system with wave function $|\Phi_+\rangle = \frac{1}{\sqrt{2}}(|00\rangle + |11\rangle)$. Now suppose that Alice applies X to her qubit. What is the new two qubit wave function? Is this state orthogonal to $|\Phi_+\rangle$?

What if Alice had applied Z to her qubit, what is the new two qubit wave function? Is this state orthogonal to $|\Phi_+\rangle$?

2. Suppose we have n qubits with the wave function $|\phi_x\rangle = \frac{1}{\sqrt{2^n}} \sum_{y=0}^{2^n-1} (-1)^{y \cdot x} |y\rangle$. What is the new n qubit wave function if we apply the n qubit unitary $Z^{\otimes n}$ to this state?