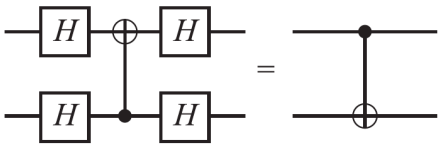
PH 441
Assignment 1

1. Given two qubits in the state $|\psi\rangle_{AB} = \frac{1}{\sqrt{2}}(|01\rangle + |10\rangle)$, what are the probabilities of measuring $|++\rangle, |+-\rangle, |-+\rangle$ and $|--\rangle$?

2. Find the expectation value of $\sigma_x \otimes \sigma_z$ measured in each of the Bell states.

3. Express U_{CCNOT} in terms of I and X

4. Show that the two circuits below are equivalent



5. Show that, $U_{AND} = (|00\rangle\langle 00| + |01\rangle\langle 01| + |10\rangle\langle 10|) \otimes I + |11\rangle\langle 11| \otimes X$