MEASUREMENT

Question 1

For the following, quantum states, what would the qubits most likely collapse to?

(a) Example: $\frac{1}{2}|00\rangle + \frac{1}{2}|01\rangle + \frac{1}{2}|10\rangle + \frac{1}{2}|11\rangle$

This state is in an equal superposition of the four states $|00\rangle$, $|01\rangle$, $|10\rangle$, $|11\rangle$.
$P(00) = (\frac{1}{2})^2 = \frac{1}{4}$
$P(01) = (\frac{1}{2})^2 = \frac{1}{4}$
$P(10) = (\frac{1}{2})^2 = \frac{1}{4}$
$P(11) = (\frac{1}{2})^2 = \frac{1}{4}$
There is an equal probability for the two qubits to be in one of the four states 00, 01, 10, 11.

(b) $|\psi\rangle = |00\rangle$

(c) $|\psi\rangle = \frac{1}{\sqrt{2}}|0> + \frac{1}{\sqrt{2}}|1>$

(d) $|\psi\rangle = \frac{1}{\sqrt{2}}|00\rangle + \frac{1}{\sqrt{2}}|11\rangle$

(e) For $|\psi\rangle = \frac{1}{\sqrt{2}}|00\rangle + \frac{1}{\sqrt{2}}|11\rangle$, if we measure the first qubit to result in 0, what can we say about the second qubit?

(f) For $|\psi\rangle = \frac{1}{\sqrt{2}}|01\rangle + \frac{1}{\sqrt{2}}|10\rangle$, if we measure the first qubit to result in 0, what can we say about the second qubit?

(g) For $|\psi\rangle = \frac{1}{\sqrt{2}}|00\rangle + \frac{1}{\sqrt{2}}|11\rangle$, if we measure the first qubit to result in 1, what can we say about the second qubit?

(h) For $|\psi\rangle = \frac{1}{\sqrt{2}}|00\rangle + \frac{1}{\sqrt{2}}|01\rangle$, if we measure the first qubit to result in 0, what can we say about the second qubit?