Assignment 2

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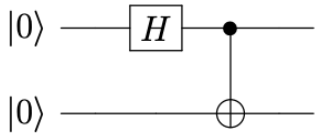
Question1

The design of Quantum simulator contains the input of the number of qubit, N lines. The gates X, Y, Z, H and special symbols are displayed. Also, o and – are displayed in this simulator. $|0\rangle$, $|1\rangle$, $|+\rangle$, $|-\rangle$ can be combined as the input.

Question2

I design the circuit as the following:



For this circuit, I use a Hadamard gate and a CNOT gate.

The input is |00>. Then, the Hadamard gate changes the state to $\frac{1}{\sqrt{2}}|00\rangle + \frac{1}{\sqrt{2}}|10\rangle$, and after the CNOT gate the state becomes $\frac{1}{\sqrt{2}}(|00\rangle + |11\rangle)$.

The output of this circuit is $\frac{1}{\sqrt{2}}(|00\rangle + |11\rangle)$

If the input is something different from |00>, the state is still entangled by this circuit. Because the output always is entangled, do not care about the state of each quit.

Question3

Yes. It will fail of inputting change to |11>.

Question4

Question5

Firstly,

$$|\psi\rangle = \alpha\,|0\rangle + \beta\,|1\rangle \qquad \text{with} \quad \alpha, \beta \in \mathbb{C} \quad \text{and} \quad |\alpha|^2 + |\beta|^2 = 1.$$

the circuit is as the following: