

- ① Write a program to generate the state

$$\frac{1}{\sqrt{2}}(|01\rangle + |110\rangle)$$

- ② Write a program to find Density matrix of the state (using qiskit, quantum-info)

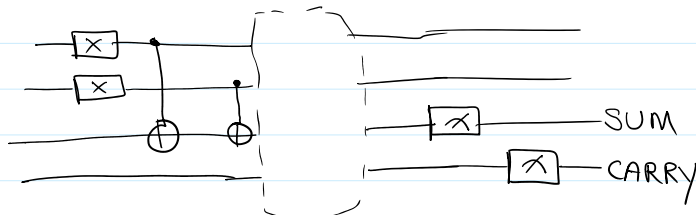
$$\frac{1}{\sqrt{2}}(|01\rangle - |110\rangle) \text{ and display the matrix.}$$


- ③ Write a program to find partial trace & then find entanglement-entropy above state.

- ④ Find the decomposition of SWAP gate into CNOT gates, write a program that shows that both the circuits perform same operation by using the class 'statevector' from qiskit-quantum-info.

⑤

Consider the circuit



Add a gate in the place of  to create a half adder circuit.

Write a program for it and show using histogram plots that it is indeed a Half adder circuit.