



NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES

SORTING CIRCUIT FOR QUANTUM COMPUTERS

INTRODUCTION

Sorting Circuits are almost non-existent for Quantum Computer(QC) However, they are curial to a number of Algorithms, in Computer Science. Our work is to implement such a circuit which runs on both simulator as well as on actual Quantum machines.

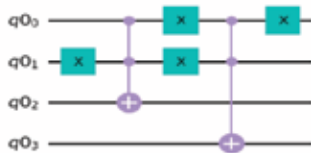
QUANTUM GATES



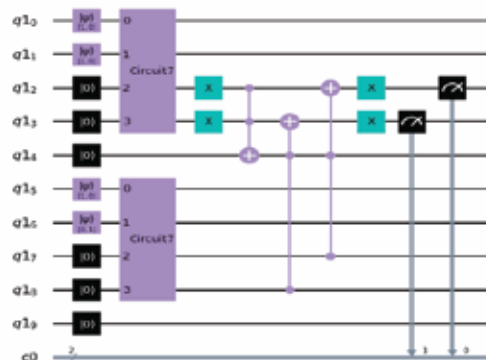
QUANTUM OPERATIONS



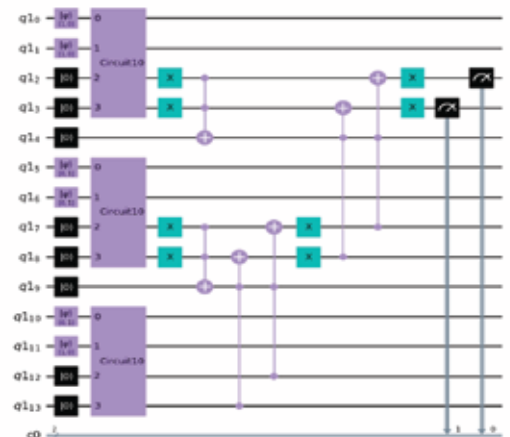
QUANTUM CIRCUITS



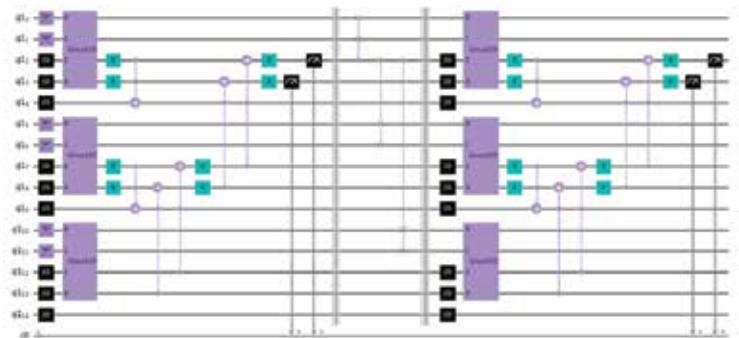
1 BIT COMPARATOR



2 BIT COMPARATOR



3 BIT COMPARATOR



SWAPPING CIRCUIT

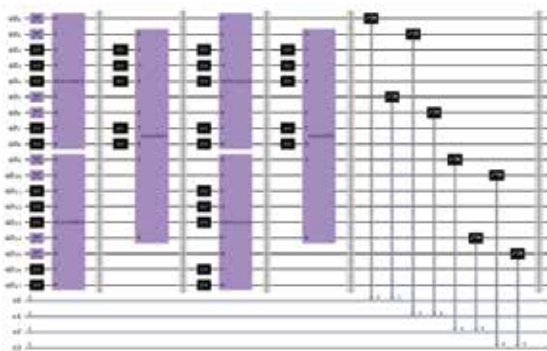
EXPLANATION

We designed 1-bit comparator using X and CX gates to compare two qubits. It will return us 0,1,2. 0 in case if both inputs are equal, 1 if input-1 is greater than input-2 and, 2 if input-2 is greater.

Then we expanded it to 2 and 3 qubits.

CONCLUSION

From the result of comparator we start swapping the qubits in such order that it returns at the end sorted list of numbers(0,1,2,3).



SORTING CIRCUIT



{ '11 01 10 00' : 1 }

SORTED ARRAY

P.S. Read the list from right to left because Quantum Computers are complicated. 🤖

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TOOLS

IBMQ

QISKIT

PYTHON

