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Task – 1

Design a quantum circuit that considers as input the following vector of integer numbers
[1, 5, 7, 10]

Returns a quantum state which is a superposition of induces of the target solution, obtaining in the output the indices of the inputs where two adjacent bits will always have different values.

In this case the output should $\frac{1}{\sqrt{2}}(|01\rangle + |11\rangle)$

Given array elements	Binary representation	Indices of elements	Binary
1	0001	0	00
5	0101	1	01
7	0111	2	10
10	1010	3	11

The correct answer for the above problem are superposition of the indices 01(corresponding to element 5) and 11 (corresponding element 10)

One method for solving the above problem is to load all the values of the array on a single quantum state and then locate the values that meet the target condition. (QRAM – A way to store multiple values)