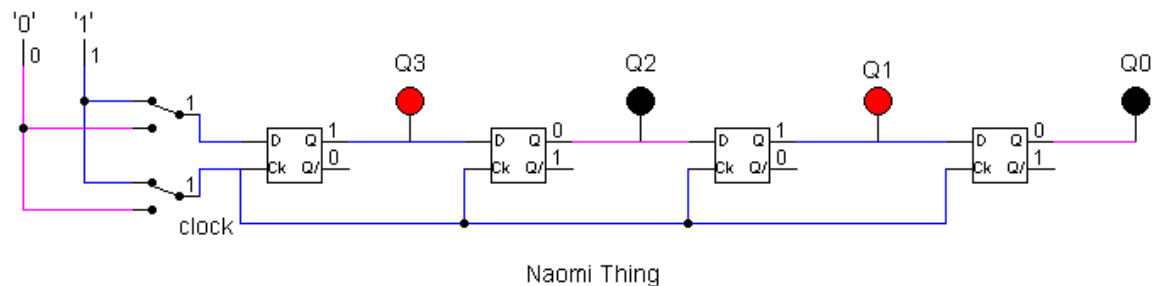


Instruction:

Complete all questions in **2 hour**.

1. Construct 4 bit Serial In parallel Out shift register using D- flip flop. Explain the Working mechanism of the circuit taking Serial input 1010. Also draw the timing diagram according to the given input.

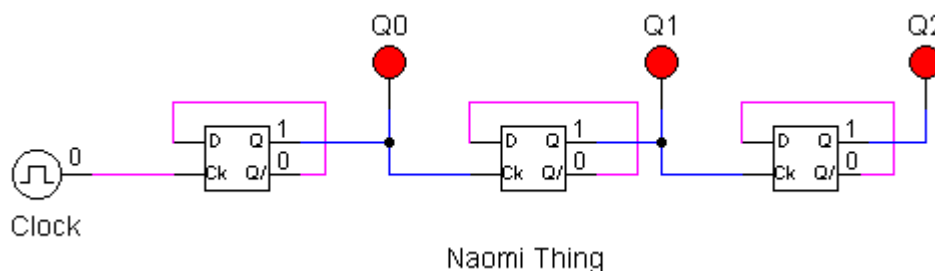


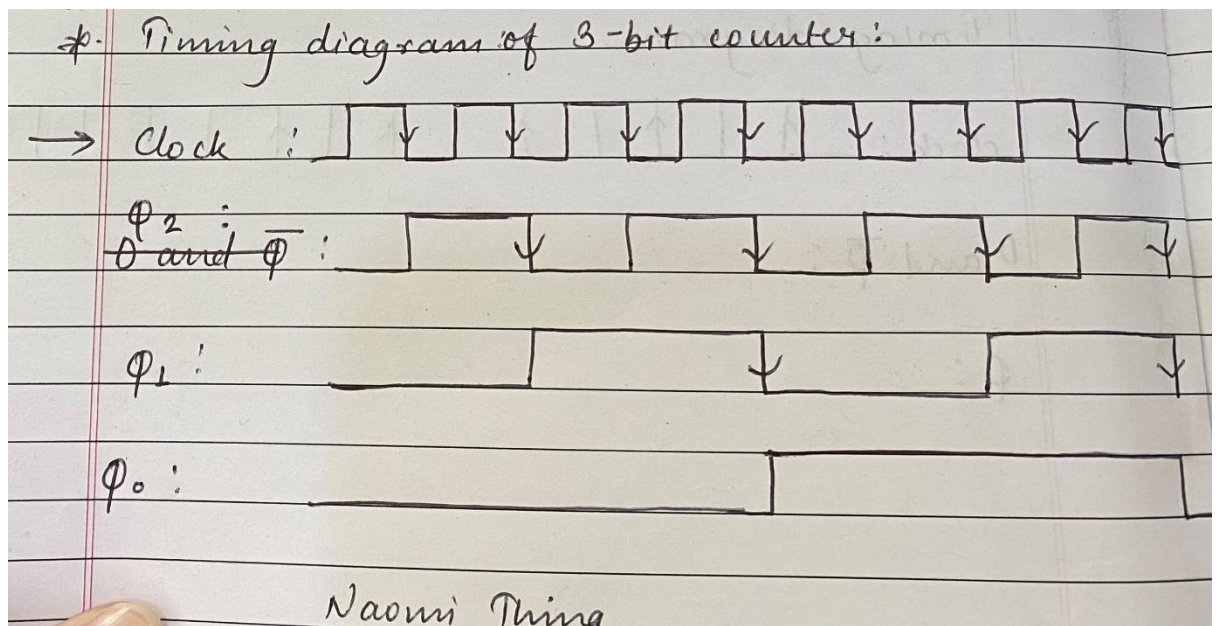
Truth Table:

Clock	Input	Q3	Q2	Q1	Q0
↑	initially	0	0	0	0
↑	0	0	0	0	0
↑	1	1	0	0	0
↑	0	0	1	0	0
↑	1	1	0	1	0

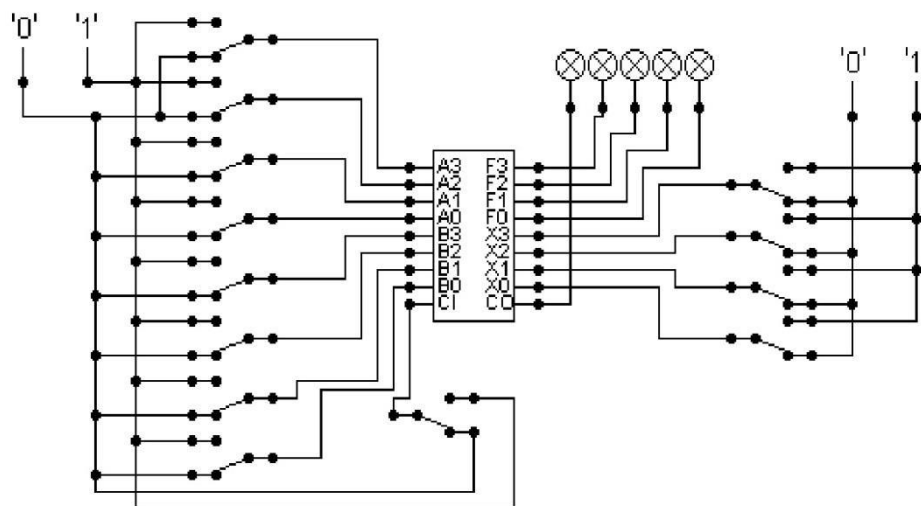
Working mechanism of circuit taking serial input '1010': in this circuit, after taking the serial input, which is 1010, we get all 0 in the Q3, Q2, Q1, & Q0 because the memory is empty. So, after we put the last input, which is 0 from the serial input 1010, the Q3 stores it and the remaining Q2, Q1, & Q0 is 0 as it remains stored in the memory. Then we put input 1 which causes Q3 to push its before-head stored data to Q2 and the Q3 has a new data which is 1. The value continues to go from Q3 to Q2, Q2 to Q1 and Q1 to Q0 as the new value is entered.

2. Design a 3 bit counter using Toggle D flip flop and draw the timing diagram.





3. Load alu.cct file from the logsim folder. The circuit should look like this



The circuit behaves like a simple arithmetic logic unit. The inputs A0-A3 represent a 4 bit binary number. Inputs B0-B3 represent another binary number. A0 and B0 are the least significant bits respectively. The following table details the functions supported by the chip. All other control lines = 0.

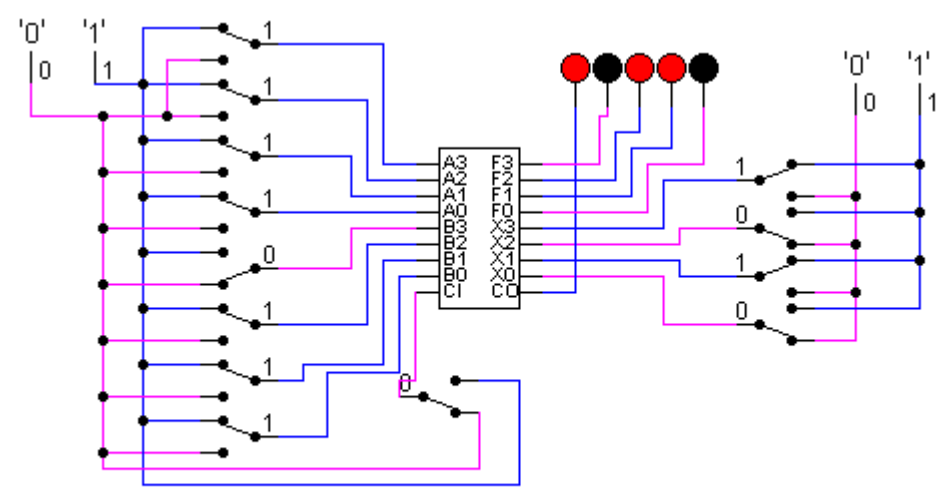
Function	Add	Subtract
X3-X0	1010	1011

- Use A = 15 and B = 7
- Use A = 13 and B = 9

Write the corresponding result of the operations. Manually provide each operation has provided the correct result.

Input	Function
A: 15=1111, 7=0111	Add: 1010

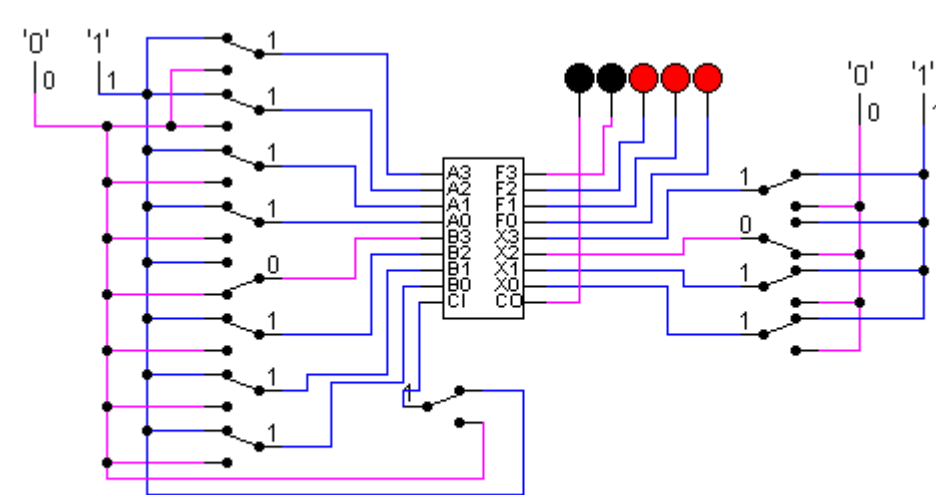
RESULT: 10110



Naomi Thing

INPUT	FUNCTION
A: 15=1111, 7=0111	Subtract=1011

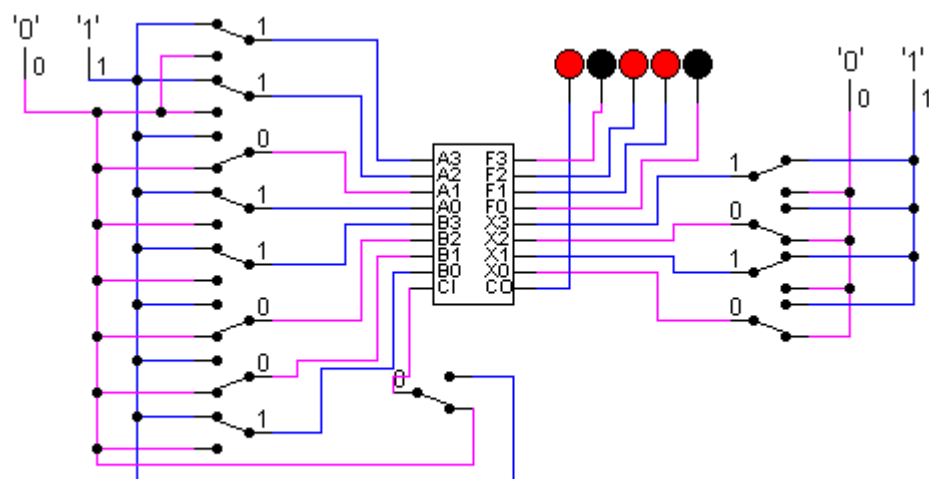
RESULT:



Naomi Thing

INPUT	FUNCTION
A: 13= 1101, 9= 1001	Add: 1010

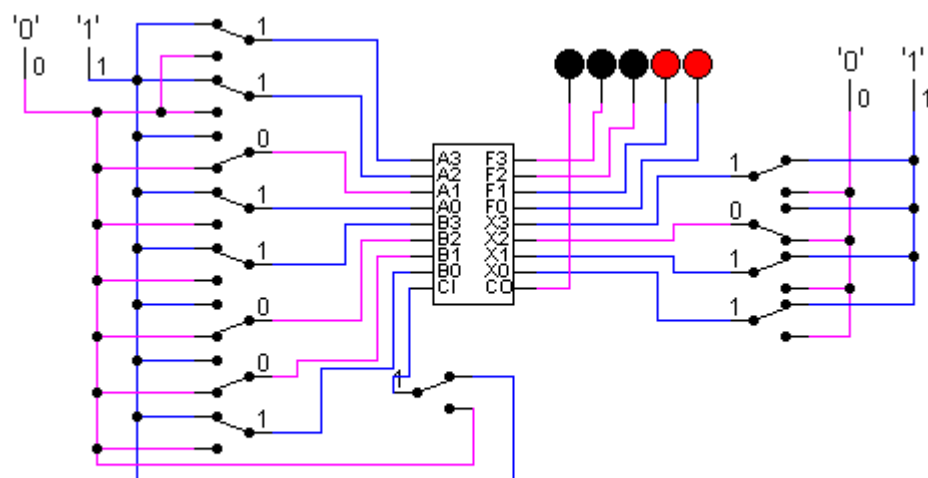
RESULT:



Naomi Thing

INPUT	FUNCTION
A: 13=1101, 9=1001	Subtract: 1011

RESULT: 0011



Naomi Thing

Thank you.