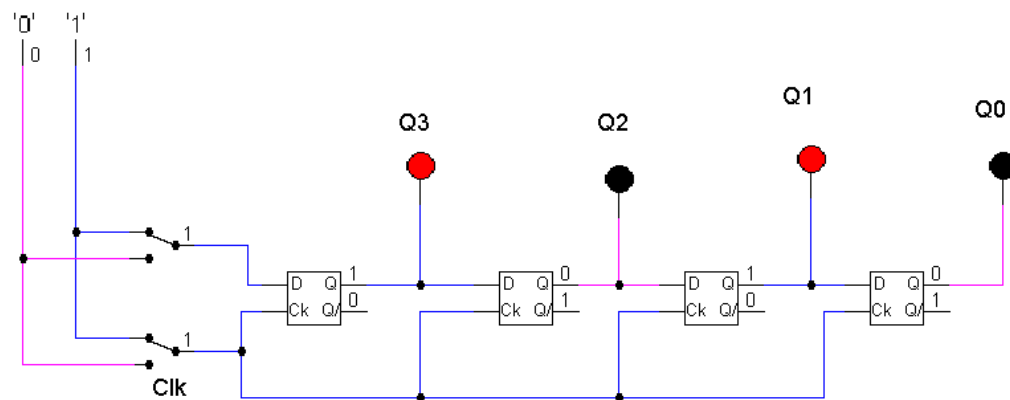


Name: Akriti Kumari Dev

Instruction:

Complete all questions in **2 hours**.

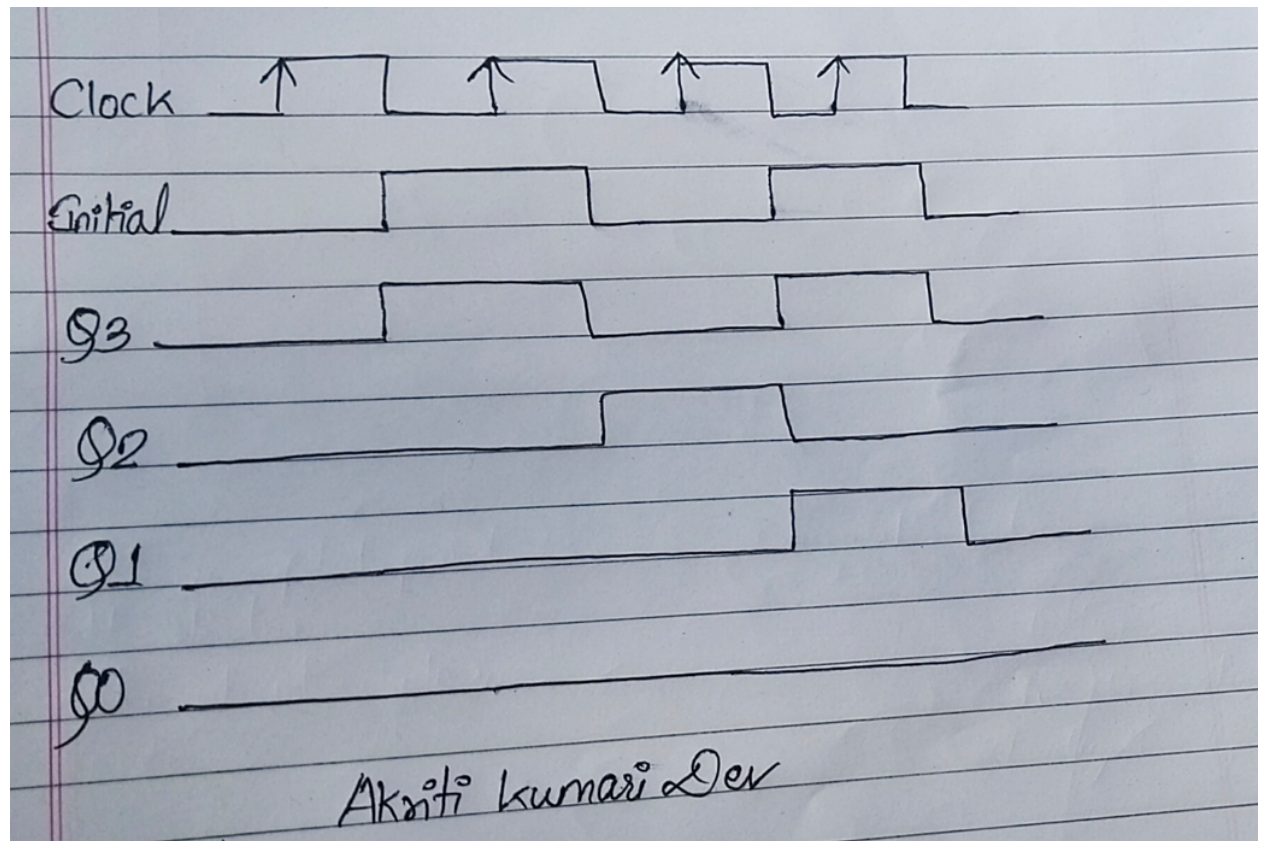
- Construct 4 bit Serial In parallel Out shift register using D- flip flop. Explain the Working mechanism of the circuit taking Serial input 1010. Also draw the timing diagram according to the given input.



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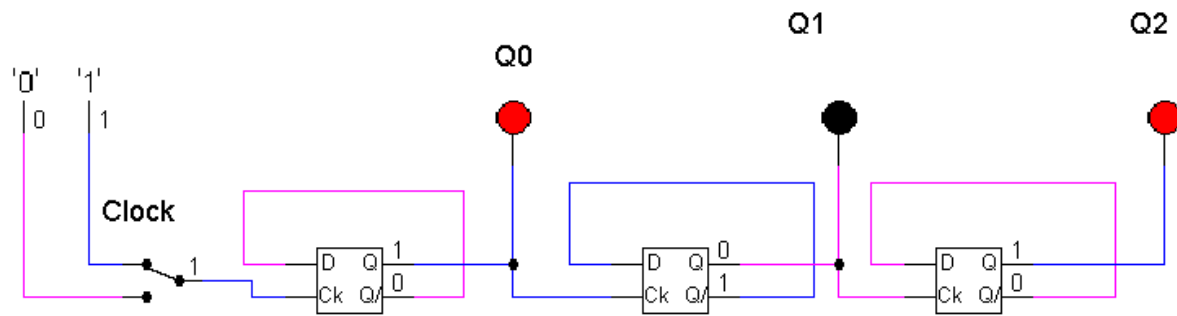
Clock	Input	Q3	Q2	Q1	Q0
1	Initial	0	0	0	0
1	0	0	0	0	0
1	1	1	0	0	0
1	0	0	1	0	0
1	1	1	0	1	0

Timing Diagram



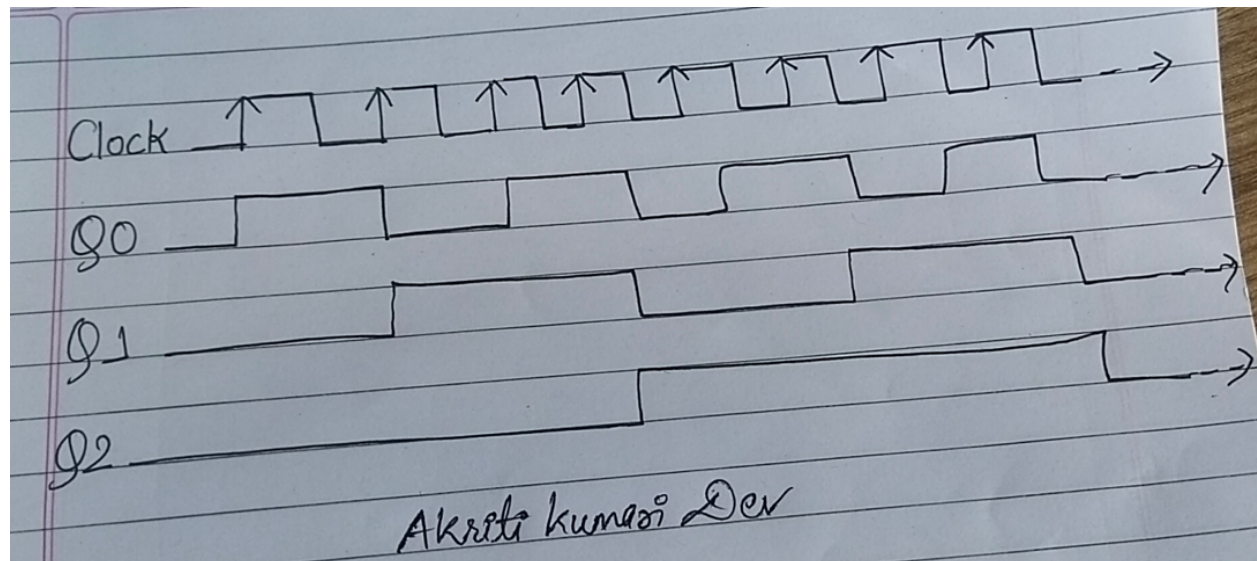
The clock is rising i.e., the value of clock is 1. At the initial state all, the values are 0 as there is no previous input to store. When the clock is at high state the value of Q3 is shifted to Q2, so the value is 0 and similarly, the values of Q2 and Q1 are shifted to Q1 and Q0 respectively. When the input is 1 then the value of Q3 is also 1 and the value of Q2 is 0 from the previous Q3 value similarly the value of Q2, Q1, Q0 are also 0 from the previous Q3, Q2 and Q1 values. When the input is 0 then the value of Q3 is also 0 and the value of Q2 is 1 from the previous Q3 value and similarly the value of Q2, Q1, Q0 are also 0 from the previous Q2 and Q1 values. When the input is 1 then the value of Q3 is also 1 and the value of Q2 is 0 from the previous Q3 value and similarly the value of Q1, Q0 are 1 and 0 from the previous Q2 and Q1 values.

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

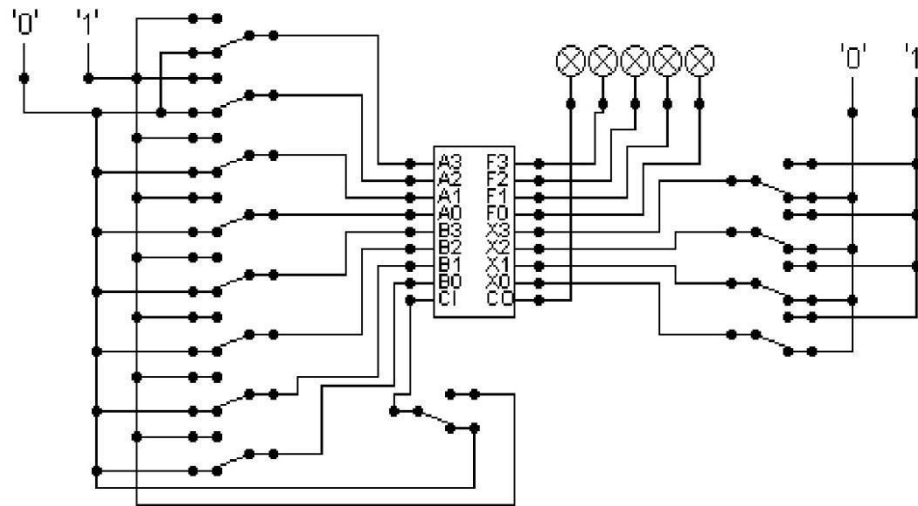


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Timing Diagram



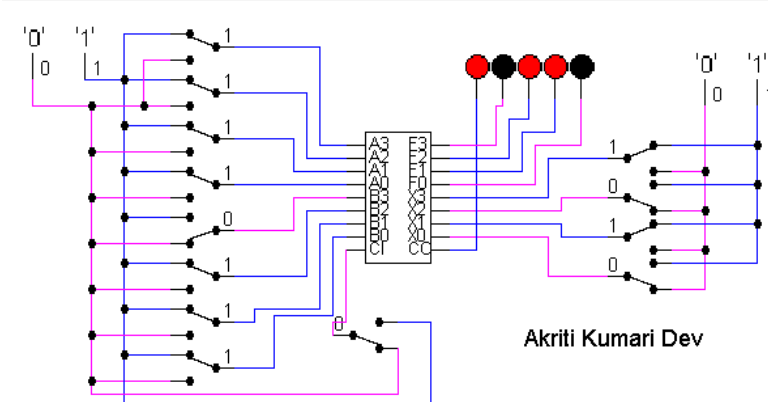
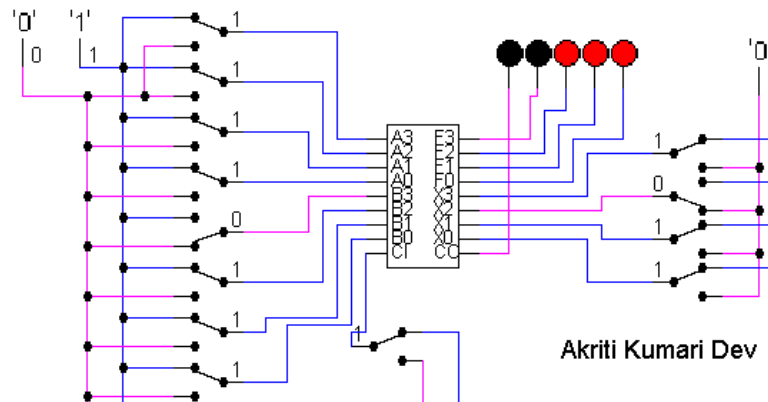
3. Load alu.cct file from the logsim folder. The circuit should look like this



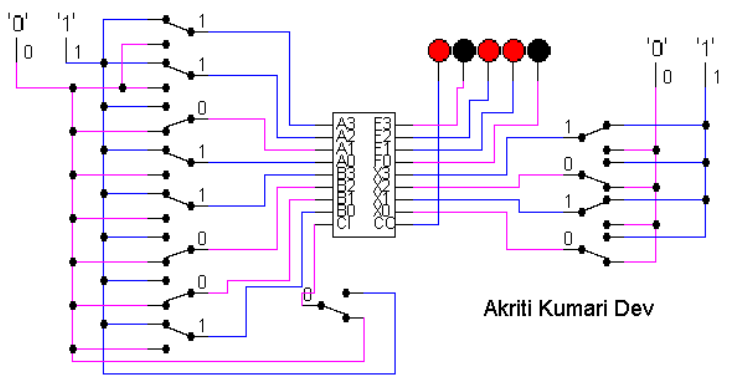
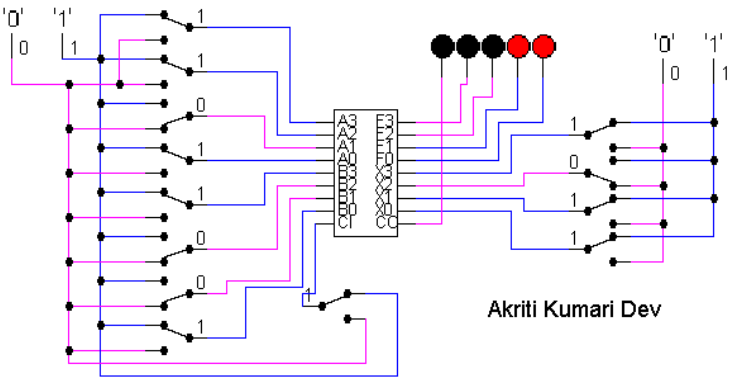
The circuit behaves like a simple arithmetic logic unit. The inputs A0-A3 represent a 4 bit binary number. Inputs B0-B3 represent another binary number. A0 and B0 are the least significant bits respectively. The following table details the functions supported by the chip. All other control lines = 0.

Function	Add	Subtract
X3-X0	1010	1011

i) Use A= 15 and B = 7

Input	Function	Result
A=15(1111) B=7(0111)	Add (1010)	 <p>Akriti Kumari Dev</p>
A=15(1111) B=7(0111)	Subtract (1011)	 <p>Akriti Kumari Dev</p>

- ii) Use A = 13 and B = 9  
Write the corresponding result of the operations. Manually providing each operation has provided the correct result.

Input	Function	Result
A=13(1101) B=9(1001)	Add 1010	 <p>Akriti Kumari Dev</p>
A=13(1101) B=9(1001)	Subtract 1011	 <p>Akriti Kumari Dev</p>

*Thank you.*