PRACTICAL REPORT

MODUL 11

DIGITAL SYSTEM

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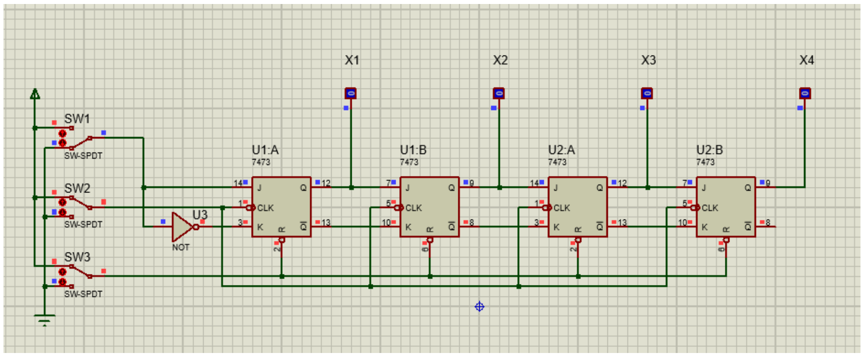
Experiment 1

1. Create the register circuit using JK-FF

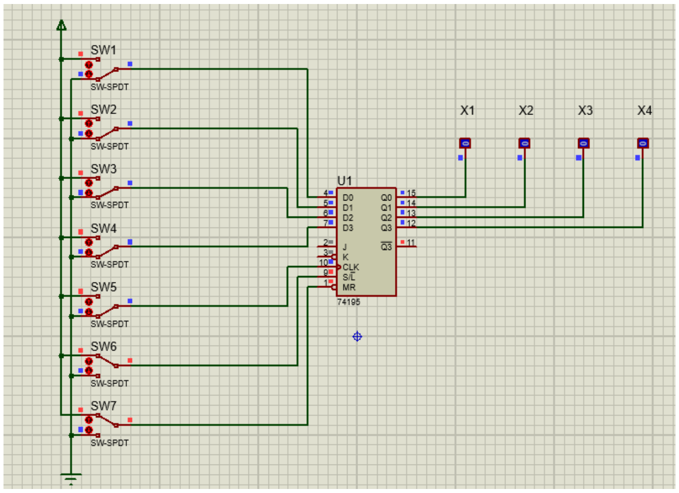


2. Run the simulation!
3. Reset the swift register by activating the SW3 switch. *(open, and then close again)*
4. Set the SW1 switch in binary position 1.
5. Give 4 shift pulse (0-1-0) through the SW2 switch, observe the register condition through PROBE condition.
6. Write down the binary from the contents of the register after 4 shift pulses are given.
   ABCD = 1111
7. Then, set the SW1 switch in binary condition 0, and give it 4 shift pulses through the SW2 switch and write down the contents of register.
   ABCD = 0000
8. By using the SW1 and SW2 switch.
   Give some loads to the shift register step-by-step in the following procedure:
   SW1 = 1, then give a pulse from SW2 switch
   SW1 = 0, then give a pulse from SW2 switch
   SW1 = 1, then give a pulse from SW2 switch
   SW1 = 0, then give a pulse from SW2 switch

9. And then observe the PROBE condition and write down the decimal number that is equivalent to the binary number in shift register.
   Binary number = 0101;   Decimal number = 5

Experiment 2

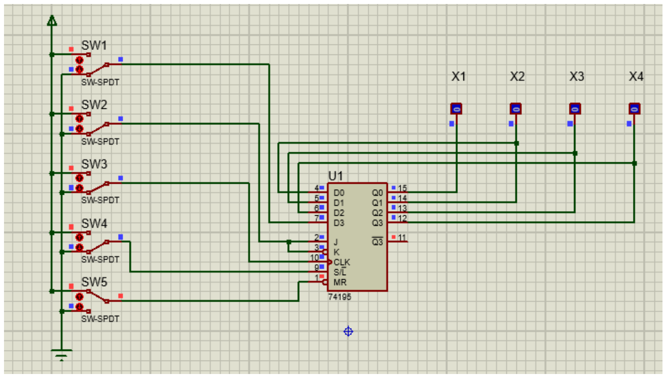
1. Create a register according to the figure.



2. The SW1, SW2, SW3 switches are used as the parallel data source.
   SW5 switch is used to generate shift pulse.
   SW6 switch is used as control mode for the circuit.
   SW7 switch is used as data reset.
3. Set all the data switches (SW1 to SW4) to the binary 0.
4. Set the SW6 to binary 0, after that SW5 is set to 0 and then set it back to 1 (giving a clock pulse), then set the SW6 switch back to 1. Write down the PROBE conditions of X1, X2, X3, and X4.
   ABCD = 0000
5. After that set all the data switches (SW1 to SW4) to binary 1.
6. Set SW6 switch to binary 0, after that SW5 switch is set to 0 and set it back to 1 (giving a clock pulse), then set SW6 switch back to 1. Write down the PROBE condition of X1, X2, X3, and X4.
   ABCD = 1111
7. Give clock pulse to SW5 switch 4 times and observe the PROBE condition after you put 4 shift pulses into shift-register and write down the result below.
   After 1 pulse: **ABCD = 0111**
   After 2 pulse: **ABCD = 1011**
   After 3 pulse: **ABCD = 0101**
   After 4 pulse: **ABCD = 1010**

Experiment 3

1. Modify the shift register circuit like in the figure.



2. You can use the SW1 switch to input the serial data in the left shift operation, SW2 switch to input the serial data in the right shift operation. SW3 switch used as clock register source. SW4 switch used as control mode of the circuit that will determine which operation it is (left or right). SW5 switch is to reset the register.
3. Run the simulation.
4. Set the switches at this following condition:
   SW1 = 0; SW2 = 0; SW3 = 1; SW4 = 0; SW5 = 1;
5. To reset the data, give input of a pulse at SW5 switch.
6. Set SW1 to binary value 1.
7. Give pulses at SW3 5 times and then write down the result in the output.
   Before any pulse given : **ABCD = 0000**
   After 1 pulse : **ABCD = 0001**
   After 2 pulse : **ABCD = 0011**
   After 3 pulse : **ABCD = 0111**
   After 4 pulse : **ABCD = 1111**
   After 5 pulse : **ABCD = 1111**
8. Set the switches at following binary condition:
   SW1 = 0; SW2 = 0; SW3 = 1; SW4 = 1; SW5 = 1;
9. To reset the data, give a pulse at SW5.
10. Set SW2 to binary 1.
11. Give pulses at SW3 5 times and then write down the result in the output.
    Before any pulse given : **ABCD = 0000**
    After 1 pulse : **ABCD = 1000**
    After 2 pulse : **ABCD = 1000**
    After 3 pulse : **ABCD = 1010**
    After 4 pulse : **ABCD = 0101**
    After 5 pulse : **ABCD = 1010**
12. Set the switches at following binary condition:
    SW1 = 0; SW2 = 0; SW3 = 1; SW4 = 0; SW5 = 1;
13. To reset the data, give a pulse at SW5.
14. Set SW1 to binary 1.

15. Give a pulse at SW3 and then write down the result in the output.
    Before any pulse given : **ABCD = 0000**
    After a pulse : **ABCD = 0001**
16. Set SW1 to binary 0.
17. Give pulses at SW3 3 times and then write down the result in the output.
    After 1 pulse : **ABCD = 0010**
    After 2 pulse : **ABCD = 0100**
    After 3 pulse : **ABCD = 1000**
18. Set SW4 to binary 0.
19. Give pulses at SW3 3 times and then write down the result in the output.
    After 1 pulse : **ABCD = 0000**
    After 2 pulse : **ABCD = 0000**
    After 3 pulse : **ABCD = 0000**
20. To understand better this experiment, try to do some other swift operations by changing the switches (SW1 to SW5) condition, so you can understand the function of the switches.

Experiment 4

1. Create the circuit like at the 3rd experiment without any changes.
2. Set the switches at following binary conditions:
   SW1 = 0; SW2 = 0; SW3 = 1; SW4 = 0; SW5 = 1;
   To reset the data, give a pulse on SW5 switch.
3. Set the SW1 switch to binary 1.
4. Give pulses at SW3 twice and write down the result.
   Before any pulse: **ABCD = 0000; Decimal number = 0;**
   After 1 pulse: **ABCD = 0001; Decimal number = 1;**
   After 2 pulse: **ABCD = 0011; Decimal number = 3;**
5. Set the SW1 switch to binary 0.
6. Give a pulse at SW3 and write down the result.
   After 1 pulse: **ABCD = 0110; Decimal number = 6;**
7. Learn the data you get above! What's the relation between the numbers you get, when the register loaded with data and the left shift operation register?
   Answer: *the number's obtained when SW5 is given the binary condition 1. The slide left operation register applies if SW4 is 0, if SW1 is given input 1; when a pulse is given to SW3, the logicprobe give an output 1. Likewise if SW1's input is 0 then the output is 0. If SW3 get a pulse again, the output will be shifted to left.*
8. What mathematical operation that formed by the slide left?
   SW1'.(SW4')'.SW5'

9. Set the switches at following binary conditions:
   SW1 = 0; SW2 = 0; SW3 = 1; SW4 = 0; SW5 = 1;
10. To reset the data, give a pulse on SW5 switch.
11. Set the SW2 switch to binary 1.
12. Give a pulse at SW3 and write down the result.
    Before any pulse: **ABCD = 0000; Decimal number = 0;**
    After a pulse: **ABCD = 1000; Decimal number = 8;**
13. Set the SW2 switch to binary 0.
14. Give a pulse at SW3 and write down the result.
    After a pulse: **ABCD = 1100; Decimal number = 12;**
15. Set the SW2 switch to binary 1.
16. Give a pulse at SW3 and write down the result.
    After a pulse: **ABCD = 0110; Decimal number = 6;**
17. Give a pulse at SW3 and write down the result.
    After a pulse: **ABCD = 1011; Decimal number = 11;**
18. Learn the data you get above! What's the relation between the numbers you get, when the register loaded with data and the left shift operation register?
    Answer: *the number's obtained when SW5 is given the binary condition 1. The slide right operation register applies if SW4 is 1, if SW2 is given input 1; when a pulse is given to SW3, the left logicprobe give an output 1. Likewise if SW2's input is 0 then the output is 0. If SW3 get a pulse again, the output will be shifted to right.*
19. What mathematical operation that formed by the slide left?
    SW2.SW4.SW5