

NIST College
Department of BScCSIT
First Semester
Digital Logic

Tutorial 6

Analysis of Clocked Sequential Machine

Analyze the following clocked sequential circuits:

1.

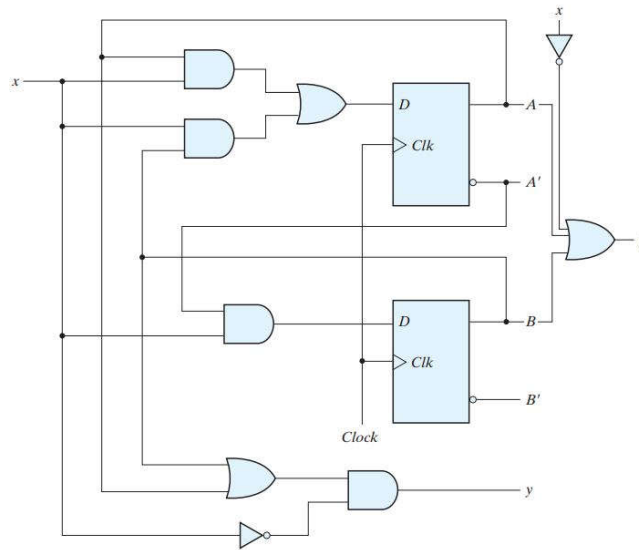


Figure 1

2.

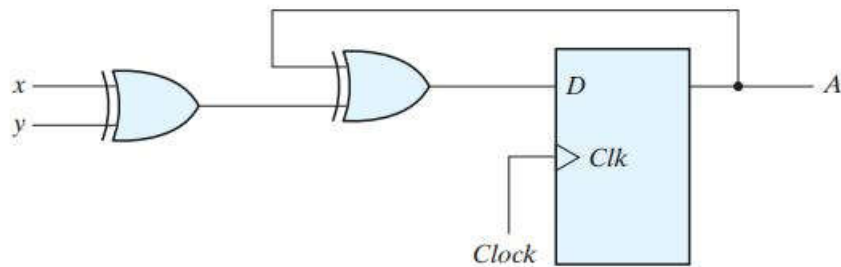


Figure 2

The circuit diagram shows two J-K flip-flops, labeled A and B. The input x is connected to the J input of flip-flop A and the K input of flip-flop B. The output of flip-flop A is connected to the K input of flip-flop B. The output of flip-flop B is connected to the J input of flip-flop A. Both flip-flops have a clock input labeled Clk , which is connected to the $Clock$ input of the circuit. The output of flip-flop A is labeled A and the output of flip-flop B is labeled B .

Figure 3

The diagram shows a sequential circuit with two D flip-flops. The top flip-flop has inputs T and Clk , and outputs A and R . The bottom flip-flop has inputs T and Clk , and outputs B and R . The output y is the result of an AND gate with inputs A and B . The output B is the result of an AND gate with inputs x and the output of the first flip-flop's T input. The output A is the result of an AND gate with inputs x and the output of the second flip-flop's T input. The output R of both flip-flops is connected to the Clk input of the other flip-flop.

Figure 4

The diagram shows a circuit with two J-K flip-flops. The input x is connected to the J input of the top flip-flop and the K input of the bottom flip-flop. The output Q of the top flip-flop is connected to the K input of the top flip-flop and the J input of the bottom flip-flop. The output Q of the bottom flip-flop is connected to the K input of the bottom flip-flop and the J input of the top flip-flop. The clock input CP is connected to the clock input of both flip-flops. The outputs are labeled A and B .

Figure 5

6.

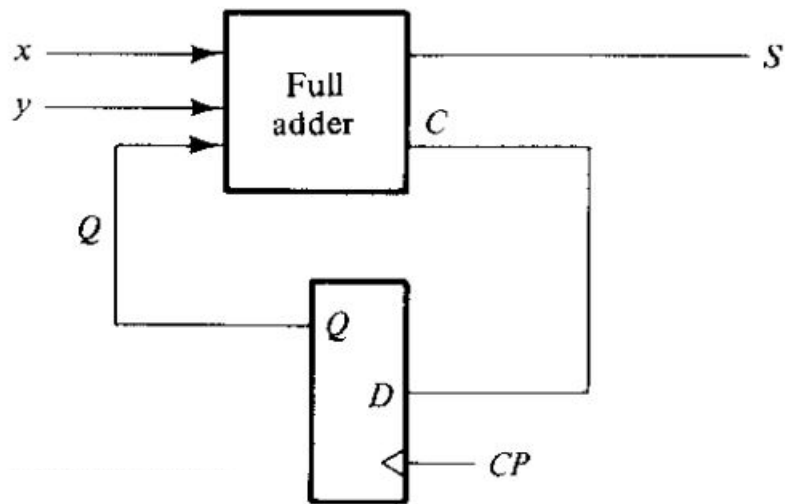


Figure 6

7.

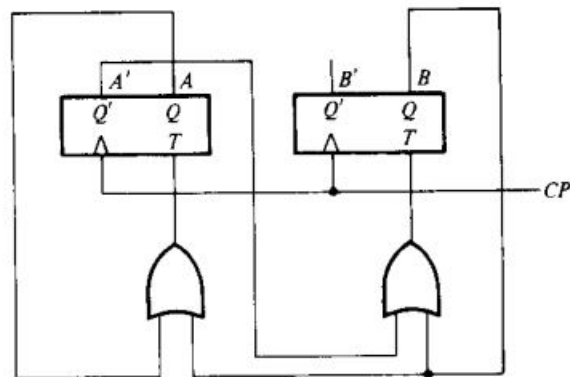


Figure 7

8. A sequential circuit with two D flip-flops, A and B ; two inputs, x and y ; and one output z , is specified by the following next-state and output equations:

$$A(t+1) = x'y + xA$$

$$B(t+1) = x'B + xA$$

$$z = B$$

- Draw the logic diagram of the circuit.
- Derive the state table.
- Derive the state diagram

9. A sequential circuit has two JK flip-flops, A and B ; two inputs, x and y ; and one output, z . The flip-flop input functions and the circuit has output function are as follows:

$$JA = Bx + B'y' \quad KA = B'xy'$$

$$JB = A'x \quad KB = A + xy'$$

$$Z = Axy + Bx'y'$$

- Draw the logic diagram of the circuit.
- Derive the next-state equations for A and B .
- Tabulate the state table.
- Draw state diagram