Queen Mary
University of London
Science and Engineering

EBU4202: Digital Circuit Design
Block 3 Tutorial

Dr. Md Hasanuzzaman Sagor (Hasan)
Dr. Chao Shu (Chao)
Dr. Farha Lakhani (Farha)

School of Electronic Engineering and Computer Science,
Queen Mary University of London,
London, United Kingdom.

Question 1

Draw the circuit diagram of a SR Latch with Control Input using only NAND gates.

Question 2

Consider the circuit shown in Figure 2. Answer the following questions:

a. What is the name for this type of sequential circuit?
b. Imagine that S now goes low. R = 0 and C = 1. Use your knowledge of the operation of gates to determine the new values of Q and QN
c. Imagine that C now goes low. S = 0 and R = 1. Use your knowledge of the operation of gates to determine the new values of Q and QN
d. Imagine that C now goes high. S = 1 and R = 0. Use your knowledge of the operation of gates to determine the new values of Q and QN

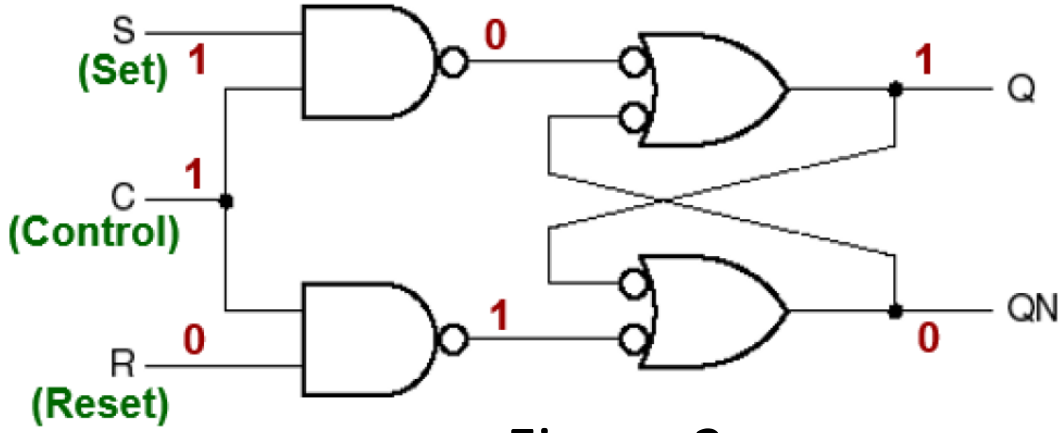


Figure 2

Question 3

Consider the circuit shown in Figure 3. Answer the following questions:

a. What is the name for this type of sequential circuit?
b. Imagine that C now goes high. D = 1. Use your knowledge of the operation of gates to determine the new values of Q and QN
c. Imagine that D now goes low. C = 1. Use your knowledge of the operation of gates to determine the new values of Q and QN
d. Imagine that C now goes low. D = 1. Use your knowledge of the operation of gates to determine the new values of Q and QN

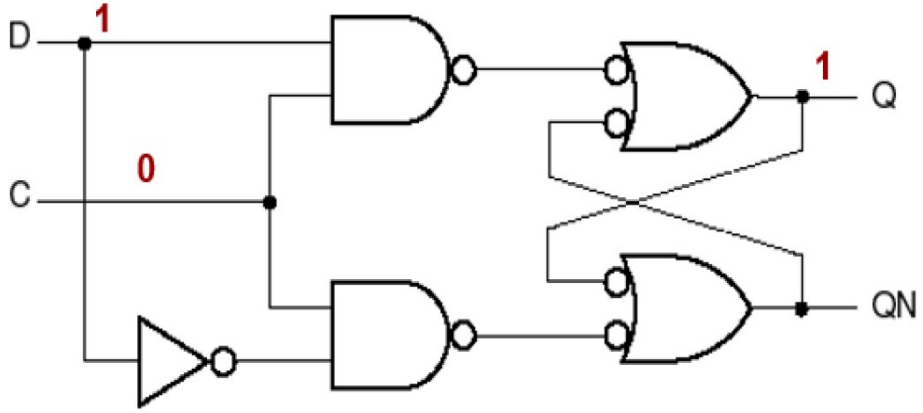


Figure 3

Question 4

What is a synchronous state machine?

Question 5

In the context of bistable elements and state machines, what is meant by the term “metastability”?

Question 6

Explain the difference between a Moore and Mealy machine.

Question 7

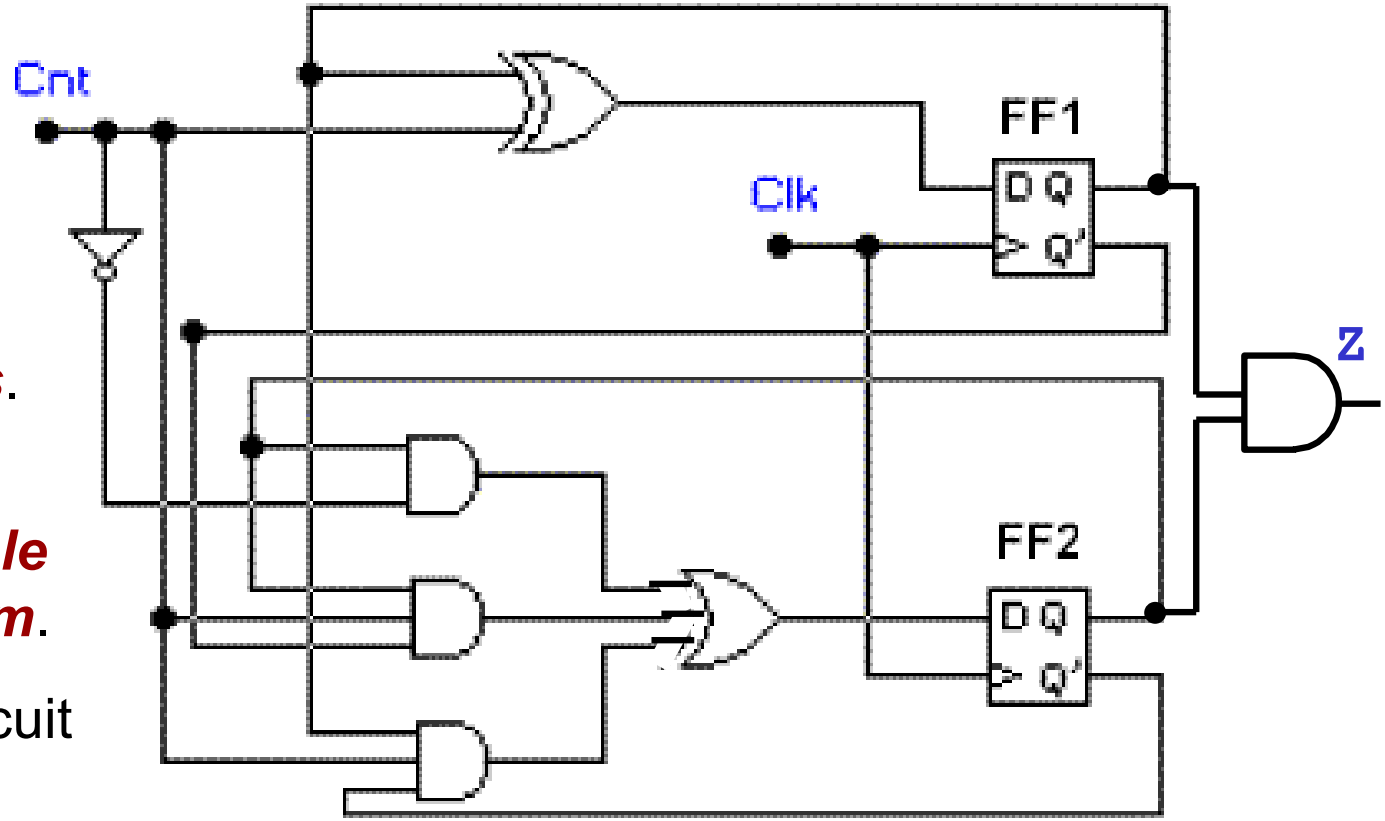
What is the minimum number of flip-flops required to store 35 states?

Question 8

What is the maximum clock frequency for a state machine having a maximum delay T_D? How can the circuit become unstable?

Question 9

- Answer the questions about the sequential circuit on the right:
  - Derive the ***input***, ***transition*** and ***output equations***.
  - Derive the ***State/Output Table*** and ***State Diagram***.
  - What does the circuit do?



5 minutes