Queen Mary
University of London
Science and Engineering

EBU4202: Digital Circuit Design
Tutorial Block 3

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Q1. Draw the circuit diagram of a SR Latch with Control Input using only NAND gates.

Q2. Consider the circuit shown in Figure 2. Answer the following questions:

a. What is the name for this type of flip-flop?
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
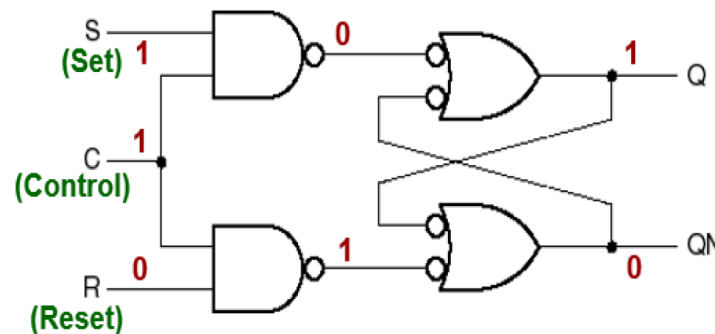
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Q3. Consider the circuit shown in Figure 3. Answer the following questions:
a. What is the name for this type of sequential circuit?
b. Imagine that C now goes high. D = 1. Use your knowledge of the operation of gates to determine the new values of 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
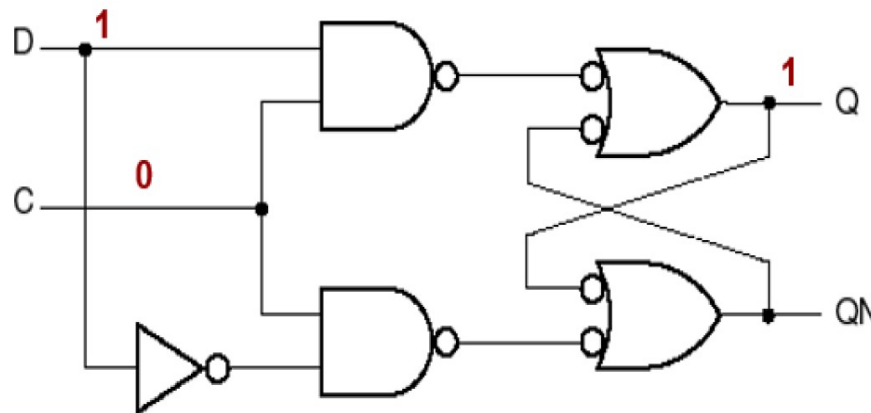
Q4. What is a synchronous state machine?

Q5. In the context of bistable elements and state machines, what is meant by the term "metastability"?

Q6. Explain the difference between a Moore and Mealy machine.

Q7. What is the maximum clock frequency for a circuit having a maximum delay T_D? How can the circuit become unstable?

Q8. Answer the following questions about the sequential circuit:
- – Derive the *input*, *next state* and *output equations*.
- – Derive the *State Table* and *State Diagram*.
- – What does the circuit do?