Homework #1 Review of Combinational and Sequential Logics
Due Date: 11:30pm on January 29th, 2024
Please upload your homework solution to D2L

Question 1: for the combinational circuit shown in Figure 1,
   a) Write the Boolean expression of T_1, T_3, T_4, F_1 and F_2 in terms of the four input variables A, B, C, D.
   b) Write the truth table showing binary values of T_1, T_3, T_4, F_1 and F_2 for all combinations of four inputs (A, B, C, D)
   c) Simplify the functions of F_1 and F_2 by using Karnaugh map method.
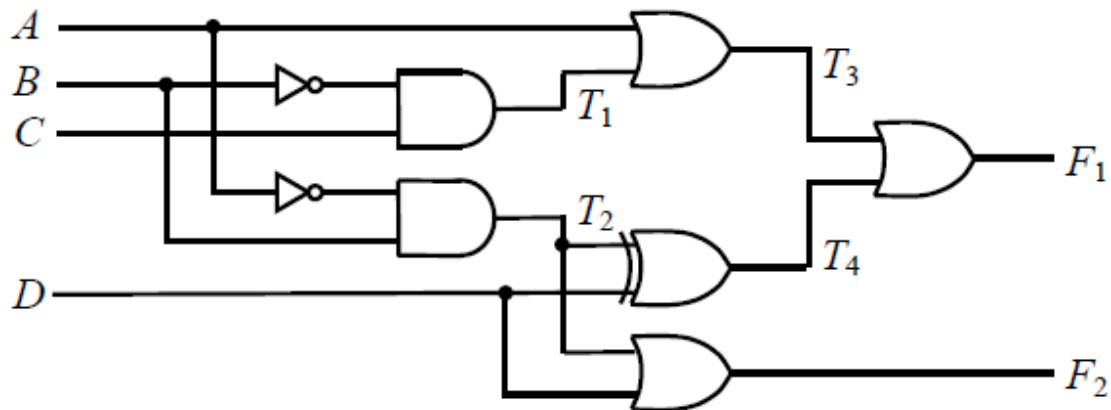

Figure 1. Combinational circuit

Question 2: consider the following sequential building blocks in Figure 2,

   a) What type of sequential block is it?
   b) Assume that S = R =1, what happens to the outputs Q and Q' when CLK transitions from a 1 to 0?
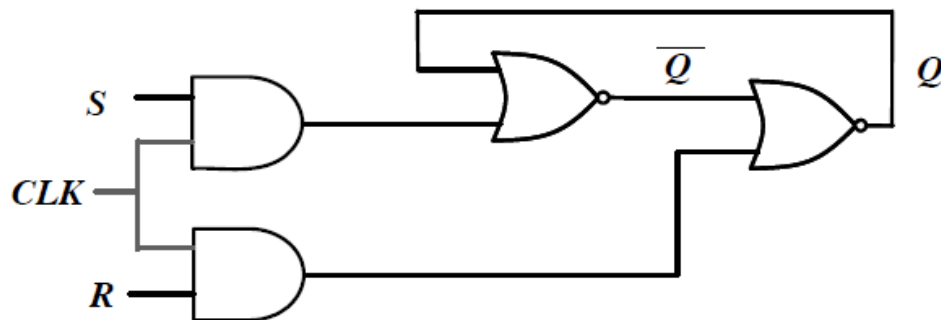

Figure 2 Sequential circuit

Question 3: the circuit in Figure 3 looks like a counter. What is the sequence that this circuit counts in? Complete the timing diagram given in Figure 3. The initial conditions of $Q_0 Q_1 Q_2$ are 000.
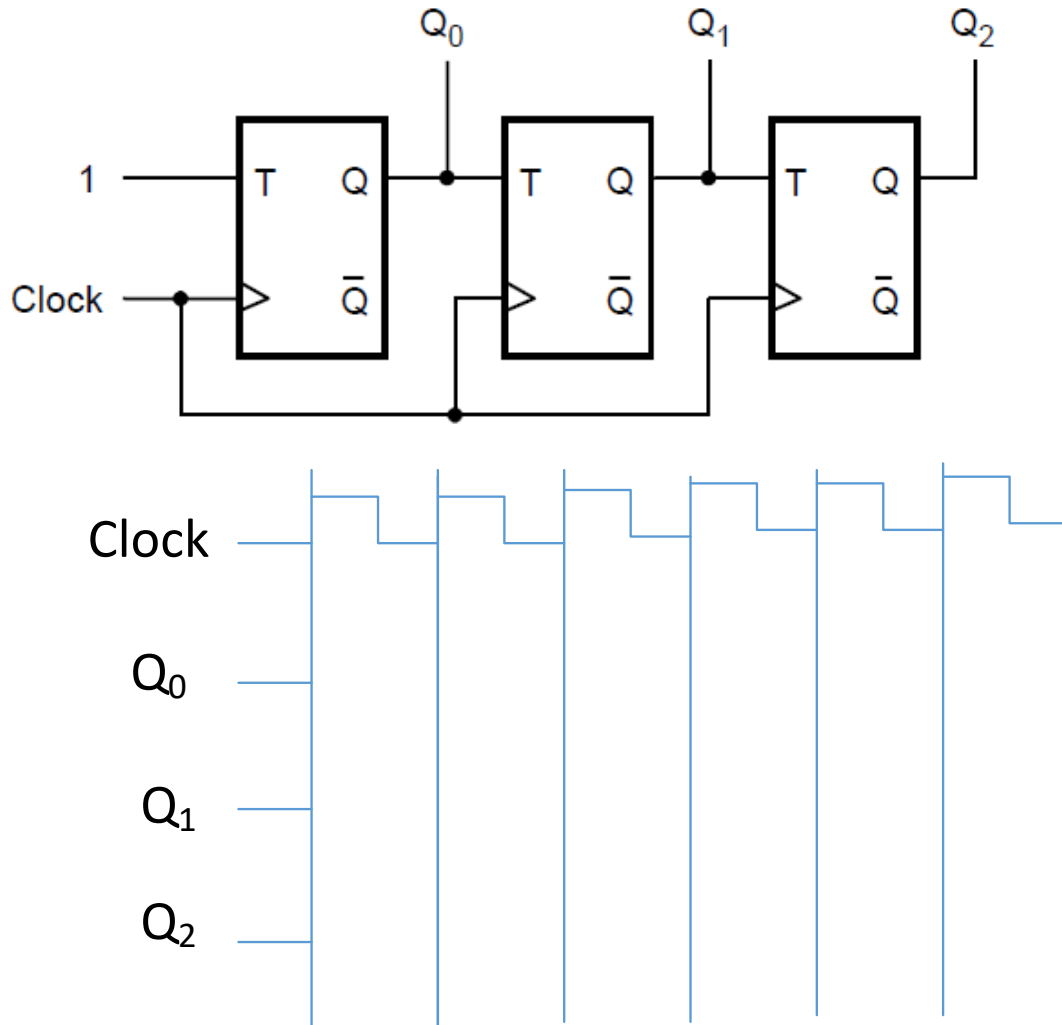

Figure 3. Counter-type circuit

Question 4: you are given the sequential circuit shown in Figure 4. Find the state diagram, state assigned table and state table for the circuit using Mealy-type FSM. Assume the state assignments as {A=00, B=01, C=10, D=11}.
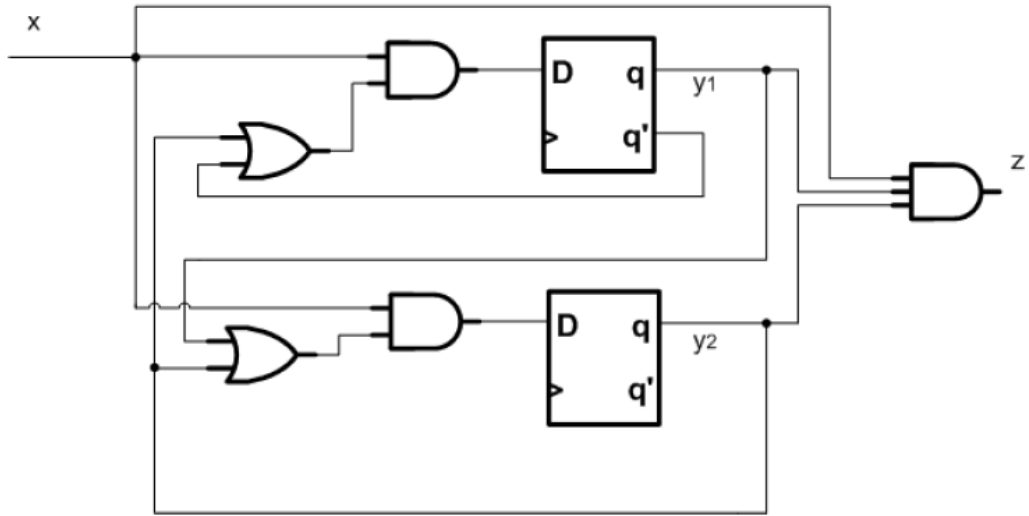
Figure 4. Finite-State Machine circuit