Digital Logic CS207

2024 Fall Assignment 3

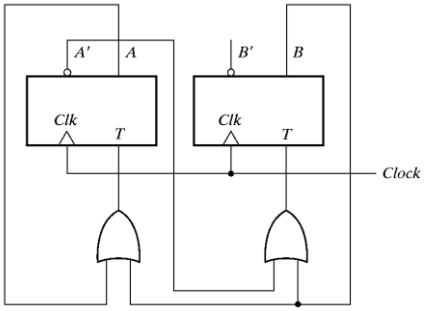
- Write neatly and submit a PDF file to Blackboard before deadline.
- Write down ALL procedures. Only presenting the final answer will lead to a zero, even the answer is correct.
- When drawing the state diagram, arrange your state circles counter clockwise (画状态图时请按逆时针方向画状态圈)

1. A sequential circuit has two JK flip-flops A and B and one input x. The circuit is described by the following flip-flop input equations:

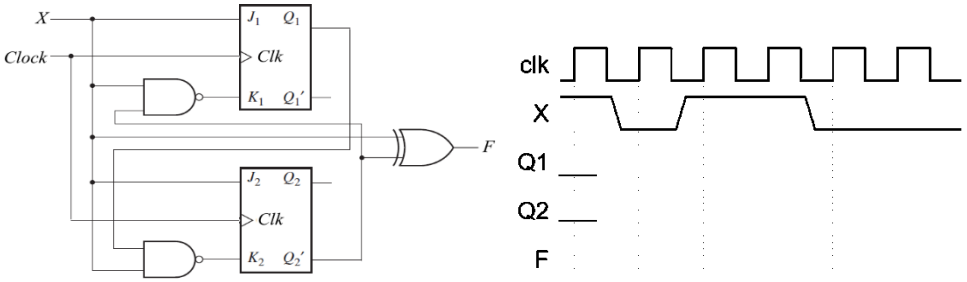
$$J_A = x, \quad K_A = B$$
$$J_B = x, \quad K_B = A'$$

   a) Derive the state equations A(t + 1) and B (t + 1) by substituting the input equations for the J and K variables.
   b) Draw the state table and state diagram of the circuit.

2. Derive the input/state/output function, state table/diagram if applicable for the sequential circuit shown in the block diagram blow. Explain the function that the circuit performs.



3. For the block diagram below
   a) Derive the input/state/output function, state table/diagram of the sequential circuit if applicable.
   b) Is it a Mealy machine or a Moore machine? Why?
   c) Construct a timing diagram for the circuit for an input sequence X = 101100.(Assume that initially Q1 = Q2 = 0, X always change midway during the clock low level, Complete the following waveform for Q1, Q2 and F.



4. For the following state table

	Next State		Output	
Present State	$x = 0$	$x = 1$	$x = 0$	$x = 1$
a	f	b	0	0
b	d	c	0	0
c	f	e	0	0
d	g	a	1	0
e	d	c	0	0
f	f	b	1	1
g	g	h	0	1
h	g	a	1	0

a) Draw the corresponding state diagram.

b) Minimize the state table, show your procedures, and then draw the reduced table and its corresponding state diagram.

c) Determine the output sequence for input sequence 01010010111 (from left to right) with the original state table and the reduced state table, starting from a.

5. The following latch is constructed from OR, AND and NOT gate, P is always equal to Q'.

a) Construct a function table for the latch and describe the behavior. Show the procedure.

b) Draw a valid timing graph to represent the behavior of the latch by covering all the valid combination of R and H. Pay attention to the forbidden state.