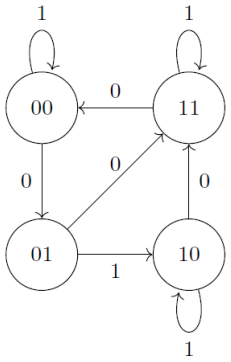
Digital Logic CS207

2024 Fall Assignment 4

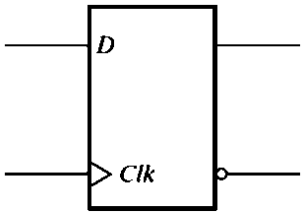
- Write neatly and submit a PDF file to Blackboard before deadline.
- Write down ALL procedures. Only presenting the final answer will lead to a zero, even the answer is correct.
- Arrange your state circles counter clockwise (画状态图时请按逆时针方向画状态圈)

1. Obtain the simplified input equations for a sequential circuit that uses T flip-flops and is specified by the state diagram below. Write down the necessary procedure. (No need to draw the logic diagram)



2. Design a FlipFlop with the function table described below. Apart of the clock input, the FlipFlop has two inputs G and In. Write down necessary design procedure as we learnt in class and then draw the block diagram. (Using DFF show in the graphic symbol with extra basic gates).

Clk	G	In	Q	Q'
0	x	x	last Q	last Q'
1	x	x	last Q	last Q'
↓	1	0	0	1
↓	1	1	1	0
↓	0	x	last Q	last Q'



3. Design a sequence detector using JKFFs to recognize the occurrence of a particular sequence of bits (1101) (using Moore machine, non-overlapping mode), write down the necessary procedure for your design (No need to draw the logic diagram)

4. (25 points) Design a sequence generator to generate the sequence 1011110 (starting with MSB) with minimum number of Flip-flops. Write down all the steps and draw the logic diagram (Graphic symbol of DFF can be used).

5. (30 points) Design a counter with T flip-flops that goes through the following binary repeated sequence: 0, 1, 3, 7, 6, 4. Derive the input equations for the FFs. Show that when binary states 010 and 101 are considered as don't care conditions, the counter may not operate properly. Find a way to correct the design.