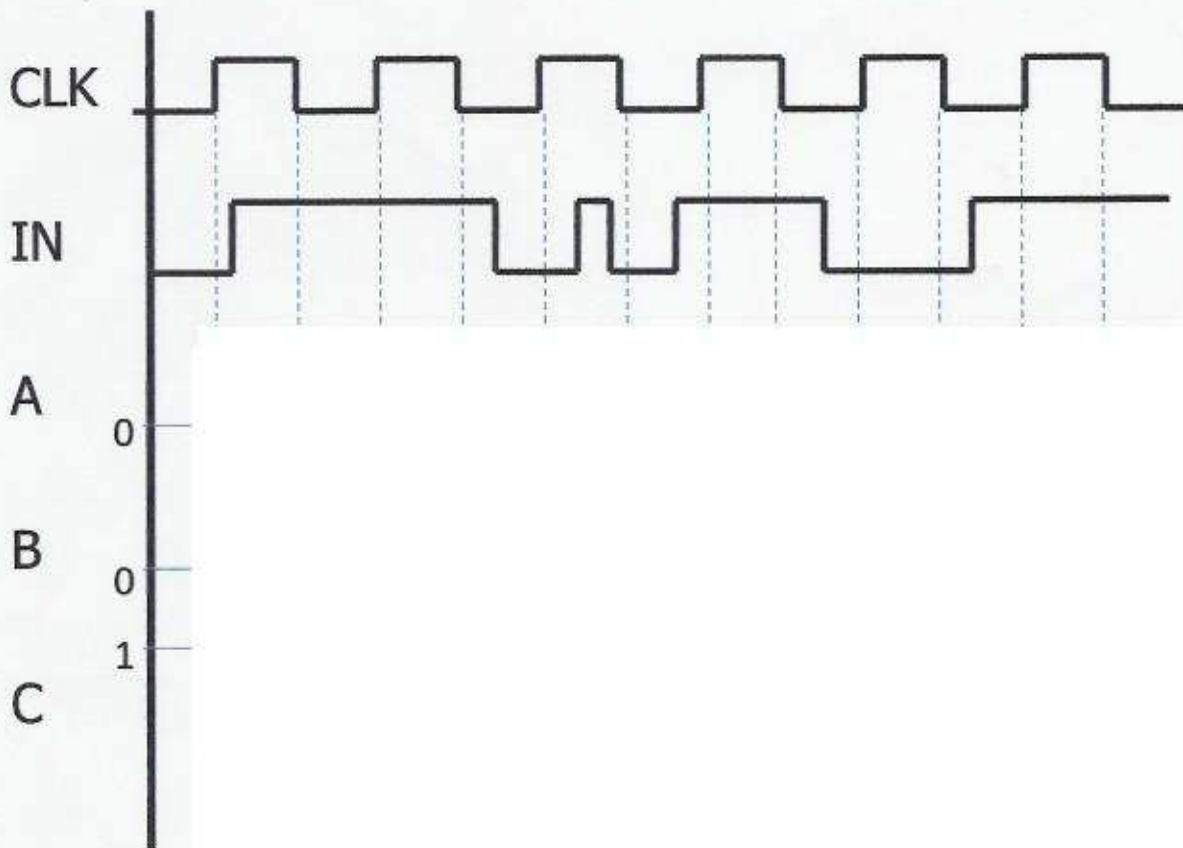
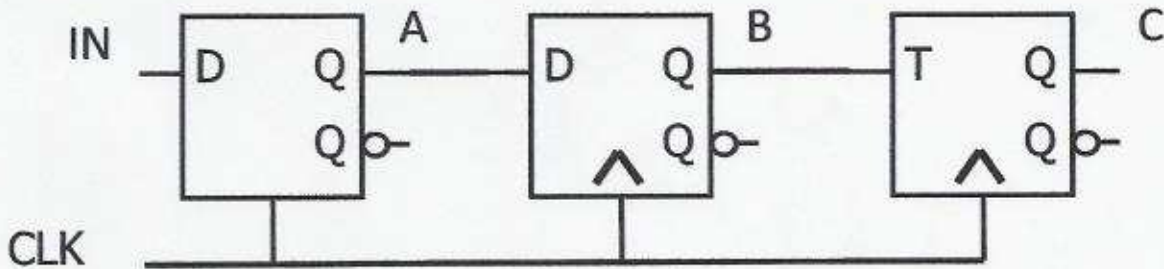


(20pts) Problem 1: Fill in the three empty lines of the timing diagram below.

A starts with 0, B starts with 0, C starts with 1. Assume each setup time, hold time, etc. is respected (so none of the inputs is changing too close to the clock edge).



(40pts) Problem 2:

We have the following 4-state counter. 000 -> 100 -> 010 -> 001 -> 000 -> ...

- (a) (8 pts) Build this counter as a ring counter (like shift registers) with D flip flops. (hint: no need to take the four steps in this part of the question.) Label output bits as Out2, Out1, and Out0.

- (b) (32pts) Now, you want to build this counter using T flip flops. Don't worry about self-starting issues. Take the following four steps: (1) draw a state diagram, (2) fill in the state transition table (hint: don't forget to also fill in the inputs to T flip flops), (3) minimize the logic using k-maps, and (4) implement the design into a circuit.

(40pts) Problem 3:

You are building a "MEALY" vending machine that sells flip-flops (the shoes!) using flip-flops. They cost 75 cents. The machine only takes quarters (Q). You can put in other coins (A), but they will all result in resetting the machine to 0 cents. The machine only has a single slot (can't put in more than one coin at a time), and after you get your flip-flops, putting in any coins (including quarters) results in resetting the machine to 0 cents.

Take the following 4 steps (steps 1 and 2 combine a couple of steps so you are basically going through all 6 steps). (1) Draw a state diagram (minimize), (2) fill in a state transition table (encode the states), (3) minimize the logic using k-maps, and (4) implement the design into a circuit. AGAIN, DON'T FORGET TO BUILD A MEALY MACHINE!