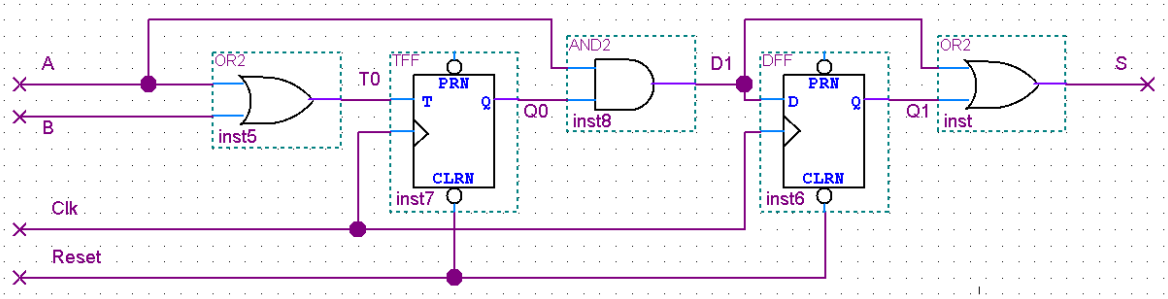
Universidad Carlos III de Madrid
Digital Electronics. 2nd partial exam. May 2013
Groups 65-69-79-95

Question 1

Given the following circuit:



a) Write the Boolean expressions of the State functions:

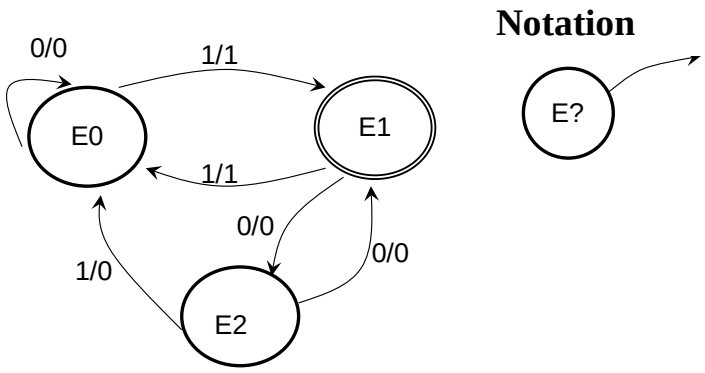
b) Write the Boolean expressions of the Output functions:.

c) Is it a Moore's Model circuit? Justify why.

d) Draw the state transitions graph of the circuit.

Question 2

Given the following STG, implement the corresponding synchronous sequential circuit, using T flip-flops.



a) Which are the inputs and outputs of the FSM?

b) Encode the states. Justify your decision on the number of flip-flops.

c) Write the transitions table

d) Find simplified expressions for the state and output functions

e) Draw the circuit using T flip-flops and a 3:8 decoder (active high outputs), and the necessary additional logic gates (using the minimum possible number of logic gates).

Question 3

We want to design a sequential circuit which can remotely control the operation of the door of a garage. In order to operate the door of garage, the remote controller sends one of the following cyclic sequences depending on the selection of the switches S0 and S1.

S1	S0	Sequence:
0	0	3-bit binary counter (natural binary code)
0	1	3-bit Gray's code counter
1	0	3-bit Ring counter
1	1	3-bit Johnson's code

Then, draw the state transition graph of a finite state machine using **Moore**'s model for the above described remote control operation.