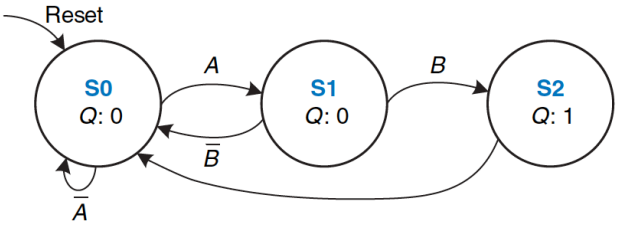
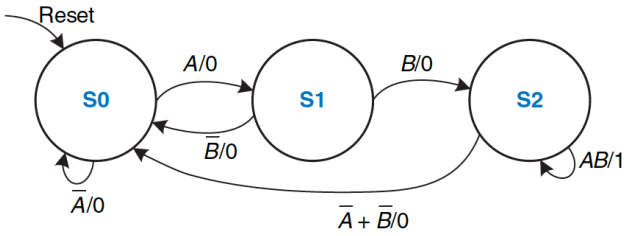
Logic Design – Homework 10



(1) Describe in words what the state machine in figure above does. Using **binary state encodings**, complete a *state transition table* and *output table* for the FSM above. Write Boolean equations for the next state and output and sketch a schematic of the FSM.



(2) Describe in words what the state machine in figure above does. Using **one-hot encodings**, complete a *state transition table* and *output table* for the FSM above. Write Boolean equations for the next state and output and sketch a schematic of the FSM.

Number	Gray code		
0	0	0	0
1	0	0	1
2	0	1	1
3	0	1	0
4	1	1	0
5	1	1	1
6	1	0	1
7	1	0	0

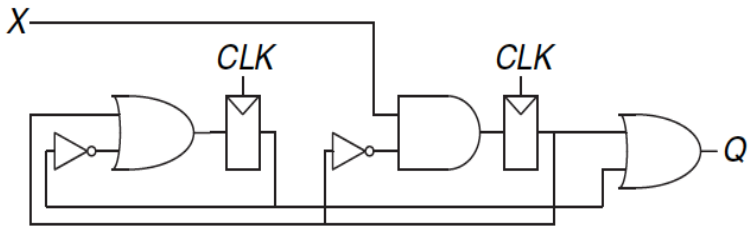
3-bit Gray Code

(3) Gray codes have a useful property in that consecutive numbers differ in only a single bit position.

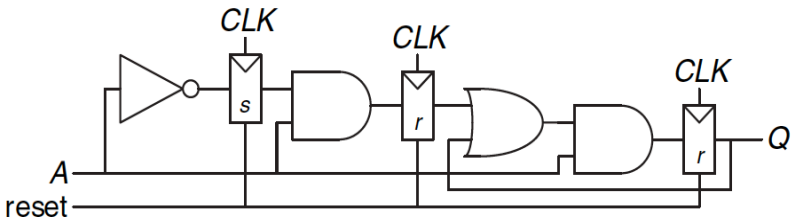
(a) Design a 3-bit modulo 8 Gray code counter FSM with no inputs and three outputs. (A modulo N counter counts from 0 to N – 1, then repeats. When reset,

the output should be 000. On each clock edge, the output should advance to the next Gray code. After reaching 100, it should repeat with 000.

(b) Extend your modulo 8 Gray code counter to be an UP/DOWN counter by adding an UP input. If UP = 1, the counter advances to the next number. If UP = 0, the counter retreats to the previous number.



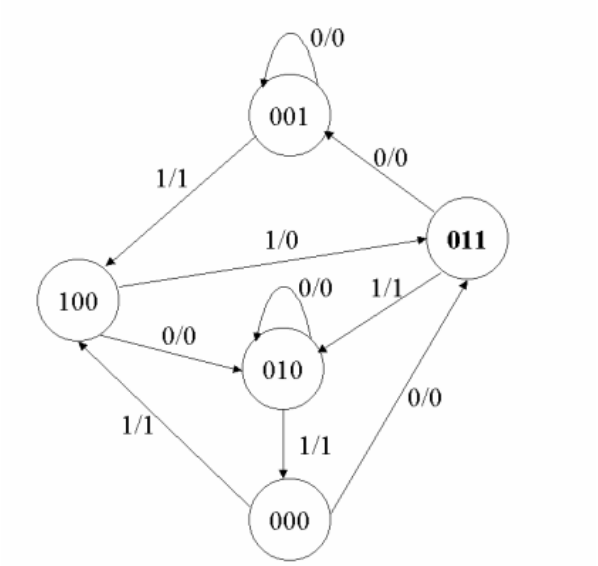
(4) Analyze the FSM shown above. Write the state transition and output tables and sketch the state transition diagram. Describe in words what the FSM does.



(5) Analyze the FSM shown above. Write the state transition and output tables and sketch the state transition diagram. Describe in words what the FSM does. Recall that the *s* and *r* register inputs indicate *set* and *reset*, respectively.

(6) Design a sequential circuit that outputs 2's complement of a bit sequence. The bit sequence will be given to the circuit in **reverse order**. For instance, if the given bit sequence is 0010101000, the circuit should output 1101011000.

(7) Design a counter that will output 1,2,3,5,8,13 and repeat again.



(8) Using **binary state encodings**, complete a *state transition table* and *output table* for the FSM above. Write Boolean equations for the next state and output and sketch a schematic of the FSM.