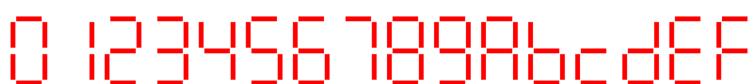
1. Examples handout questions 14 through 20
2. Draw a state machine that takes in a sequence of bits at its input IN and outputs 1 if the number of 1's it has seen is even, 0 otherwise. Also, if the machine ever encounters the bit sequence 1001, it should output 0 regardless of the input. You don't need to actually implement the logic for this state machine (just drawing state machine diagram is sufficient).
3. Design a 3 flip-flop counter that transitions through states $Q_2Q_1Q_0 = 000$, 100, 110, 111, 011, 001 and then repeats.
   (a) Draw a state diagram and state transition table for this counter.
   (b) Derive the next-state functions in product-of-sums form.
   (c) Is your counter self starting? Justify your answer. If not, change it to make it self starting.
4. Draw the state diagram, state assignments, and next-state logic for a Moore FSM that takes as input a sequence of 3-bit unsigned numbers (one number each clock cycle) and has a single output that is high whenever two consecutive input values are divisible by 3, and low otherwise.
5. Seven-segment displays are frequently used to display numeric digits and certain letters. You have been asked to design a display that continuously cycles through the first 8 numbers in the Fibonacci sequence in base 16 (i.e., 0, 1, 1, 2, 3, 5, 8, D) using the following number/letter shapes below:



   (a) Compare the advantages of designing using one-hot state encoding versus sequential state encoding.
   (b) Suppose you elect to solve this problem using one-hot state encoding. Describe your state encoding. In particular, explain how many state bits are required.
   (c) Provide an identifier for each state bit in your assignment scheme. What is the combinational logic required for the output driving the bottom left segment of the display (i.e, the one highlighted in black below) in terms of your state bit identifiers?