1. Design a Moore machine that detects the sequence of X = '1' followed by '1' followed by '0', i.e., the output of the machine Z will be 1 when the sequence '110' is detected. For example,

$$X = 001110010001011100000101110$$
$$Z = 000001000000000100000000001$$

Please show the state diagram and the state table of the machine. **Hint**, slides 6-12 in Lecture 26 will help you to solve the problem.

2. Design a Mealy state machine that can transform a BCD input to Excess-5 output. First, fill in the table blow which represents the input-output relationship of the machine, and then show the state diagram and the state table. **Hint**, this problem is similar to the problem solved in slides 1 and 2 in Lecture 27.

X input (BCD)				Z output (excess-5)			
t_3	t_2	t_1	t_0	t_3	t_2	t_1	t_0
0	0	0	0				
0	0	0	1				
0	0	1	0				
0	0	1	1				
0	1	0	0				
0	1	0	1				
0	1	1	0				
0	1	1	1				
1	0	0	0				
1	0	0	1				

3. The state machine of the Craps game in Lecture 28 slide 7 is not a pure Moore machine or a pure Mealy machine. It is a mix of the two machines because the output sometimes depends only on the current state (Moore) and another time depends on the input and current state (Mealy). Transform the state machine to a pure Mealy state machine. Please show the state diagram of the machine. **Hint**, the state diagram is similar to the state diagram in Slide 7 of lecture 28, but with only 5 states. One state needs to be removed. Note that this controller has four outputs: Roll, SB (Store Pointer), Win, Loose. You only need to write which output is high when transitioning from one state to another. If none of the outputs is high, then put 0 as shown in slide 7.