Problems for Assignment 2

1. An FSM that has an input w and an output z. The machine has to generate z = 1 when the following patterns in w are detected: 010 or 101; otherwise, z = 0. Overlapping input patterns are not allowed. **Draw the state diagram, the state assigned table.**

Clock	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}	t_{13}	t_{14}	t_{15}	t_{16}
w	0	0	1	0	1	1	0	1	0	0	1	0	1	0	1	0
Z	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1

2. You have to design a vending machine for a 4 Tk product. The vending machine can only accept inputs Tk 1 (can be represented as input w=0) and Tk 2 (can be represented as input w=1). Once an acceptable input is more than or equal to 4 Tk, the machine immediately generates an output Q=1 and goes back to the initial state. **Draw the state diagram, the state assigned table.**

Clock	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}	t_{13}	t_{14}	t_{15}	t_{16}
w	0	0	1	0	1	1	0	0	0	0	1	1	1	1	1	0
Q	0	0	1	0	0	1	0	0	0	1	0	1	0	1	0	0

3. A sequential circuit has two inputs, w1 and w2, and an output z. It's function is to compare the input sequences on the two inputs. If w1 = w2 during three consecutive clock cycles, the circuit produces z = 1 otherwise z = 0. **Draw the state diagram, the state assigned table.**

Clock	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}	t_{13}	t_{14}	t_{15}	t_{16}
w1	0	1	1	0	1	0	1	0	0	1	1	1	0	0	0	0
w2	1	1	1	0	1	1	1	0	0	0	1	1	0	0	1	1
Z	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	0

4. Design a 3-bit palindrome sequence detector with overlapping inputs. A sequence is a palindrome if the sequence remains the same even if you reverse the sequence. For example, 101 remains 101 even if you read it in backward direction. The output z will immediately become high, after successfully detecting a palindrome sequence. **Draw the state diagram, the state assigned table.**

Clock	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}	t_{12}	t_{13}	t_{14}	t_{15}	t_{16}
W	0	0	0	0	1	1	0	1	0	0	1	1	1	1	0	0
Z	0	0	1	1	0	0	0	1	1	0	0	0	1	1	0	0