

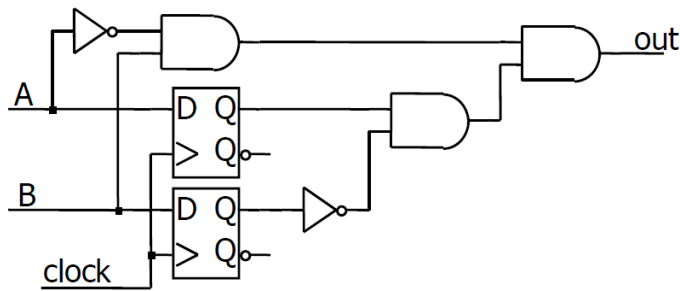
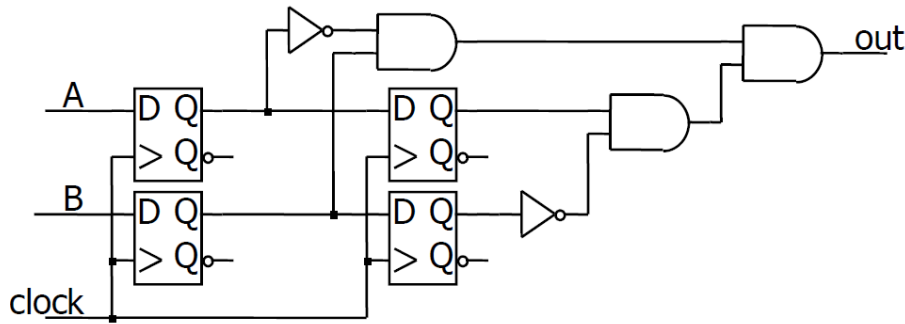
EHB205E Introduction to Logic Design

Homework 4

Deadline: 27/12/2019 (submit to the TA Emre Altuner before 12:30)

1. SEQUENTIAL CIRCUITS: CIRCUITS TO STATES

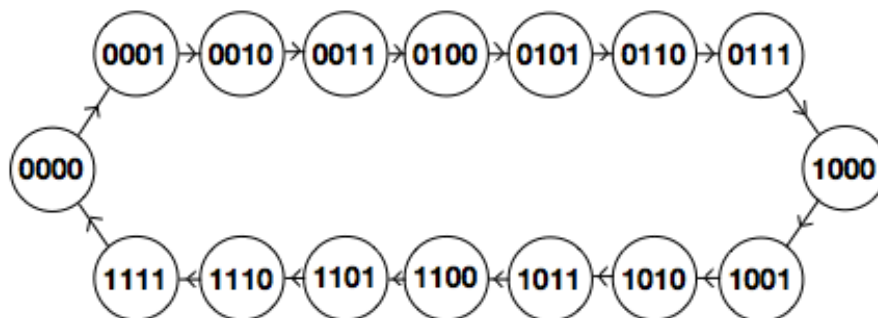
Consider sequential circuits shown below.



- Obtain **state diagrams** and **state tables** of these two circuits.
- Determine whether these circuits are **Mealy** or **Moore** machines.
- Find the input conditions these circuits aim to recognize.
- Explain the differences in terms of working principles of these two circuits.

2. SEQUENTIAL CIRCUITS: STATES TO CIRCUITS

Consider a state diagram shown below. Implement this state diagram using T (toggle) flip-flops and AND gates. What is the purpose of the circuit?



3. STATE REDUCTION

Reduce the following state table to a minimum number of states. The input is X and the output is Z .

state	$X = 0$	$X = 1$	Z
a	c	f	1
b	h	f	1
c	i	h	1
d	a	e	0
e	e	i	1
f	a	c	0
h	a	b	0
i	a	b	0
j	c	i	1

4. STATE MACHINE SYNTHESIS

Design a counter with a control input. When the input is high, the counter should sequence through three states: 10, 01, 11 and repeat. When the input is low the counter should sequence through the same states in the opposite order 11, 01, 10 and repeat.

- Draw the state diagram and state transition table.
- Implement the counter using D flip-flops and gates.

Grading: 1a) 20%, 1b)5%, 1c)5%, 1d)5%,

2)15%

3)20%

4a)15%, 4b)15%

Note: Return a hard-copy of your homework; you can put your homework under my door.