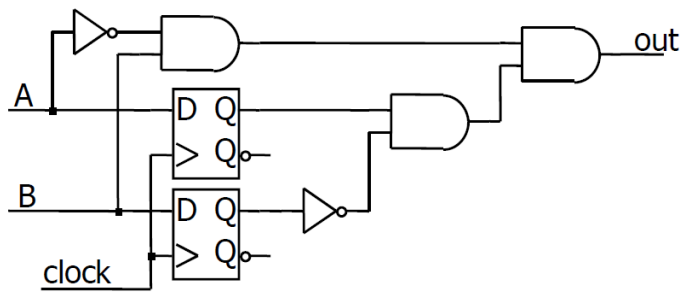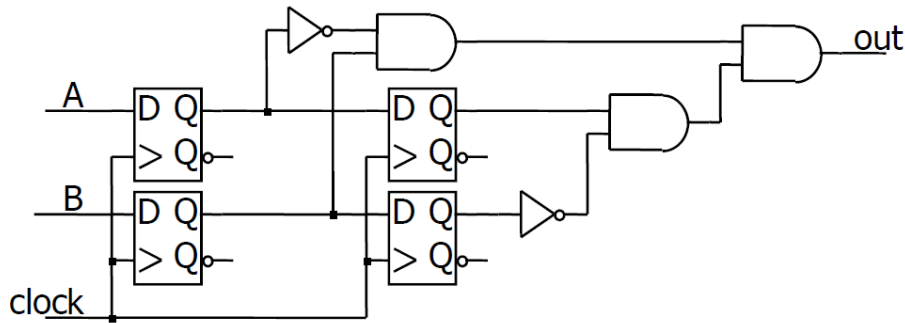# BLG231E Digital Circuits
Homework 3
Deadline: 30/12/2016 (before 9:30)

1. **SEQUENTIAL CIRUITS: CITCUITS TO STATES**
   Consider sequential circuits shown below.

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

2. **SEQUENTIAL CIRUITS: 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?
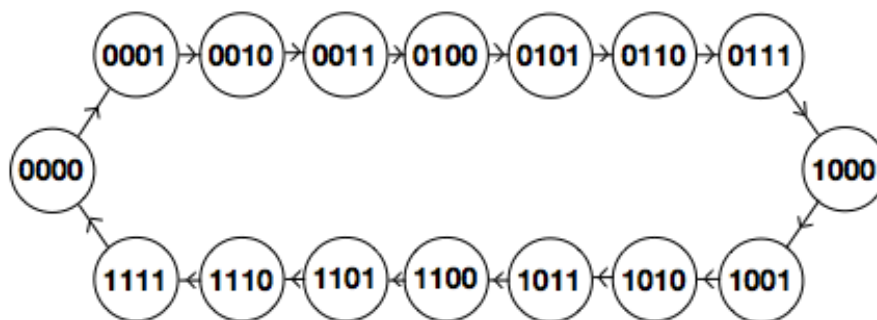
3. STATE REDUCTION

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.

a) Draw the state diagram and state transition table.
b) 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.*