ENG-2410 Assignment #7

School of Engineering, University of Guelph
Fall 2025

Start Date: Week #8, Due Date: Week #9 (Friday, 5:00 PM) in Dropbox

1. Design a sequential circuit with two **D** flip-flops **A** and **B** and one input **X**. When **X=0**, the state of the circuit remains the same. When **X=1**, the circuit goes through the state transition from **00** to **10** to **11** to **01**, back to **00**, and then repeats.

2. Design a sequential circuit with two JK flip-flops A and B and two inputs E and X. If E=0, the circuit remains in the same state, regardless of the value of X. When E=1 and X=1, the circuit goes through the state transitions from 00 to 01 to 10 to 11, back to 00, and then repeats. When E=1 and X=0, the circuit goes through the state transitions from 00 to 11 to 10 to 01, back to 00, and then repeats.

3. A sequential circuit has two flip-flops A and B, one input X and one output Y. The state diagram is shown in Figure 1. Design the circuit with D flip-flops.

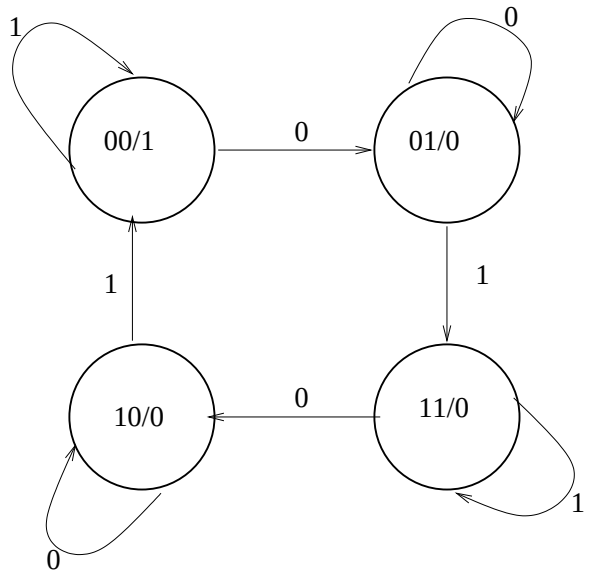

Figure 1: State Diagram

4. The state table for a twisted ring counter is given in Table 1. This circuit has no inputs, and its outputs are the un-complemented outputs of the flip-flops. Since it has no inputs, it simply goes from state to state whenever a clock pulse occurs.

Present State ABC	Next State ABC
000	100
100	110
110	111
111	011
011	001
001	000

Table 1: State Table

(a) Design the circuit using **D** flip-flops and assuming that the unspecified next states are don't care conditions.

(b) Add the necessary logic to the circuit to initialize it to the state **000** on power-up master reset.

5. Design a synchronous BCD counter with JK flip-flops.

Deliverable

- **Name your file** as follows: ENG2410_F25_Assignment7_LastNameFirstName.pdf
- **Write** your name, the course # and Term # on the first page of your submission (i.e solution).
- **Submit** a single PDF file of your solutions.
- **Upload** your PDF file in the Course Link dropbox.
- **Late** submissions are not accepted.
- Your solution of the assignment will **not be accepted** via email.
- To **receive 100% of the mark** you should attempt all questions.
- Solutions to the assignment will be posted at 5:30 PM on Fridays.
- If you have any questions related to the assignment, please **contact your Teaching Assistant** responsible for your Tutorial Section.
- Failing to follow the instructions above will lead to a ZERO grade!!