CSSE2010

CSSE2010/CSSE7201
Learning Lab 6

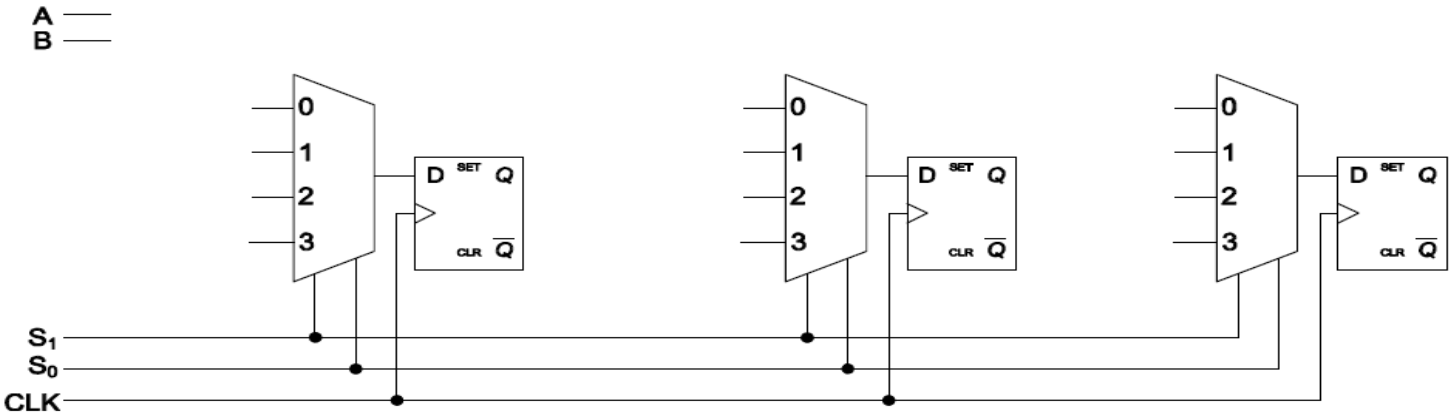
Sequential Circuits 1
Shift Registers

School of Information Technology and Electrical Engineering
The University of Queensland

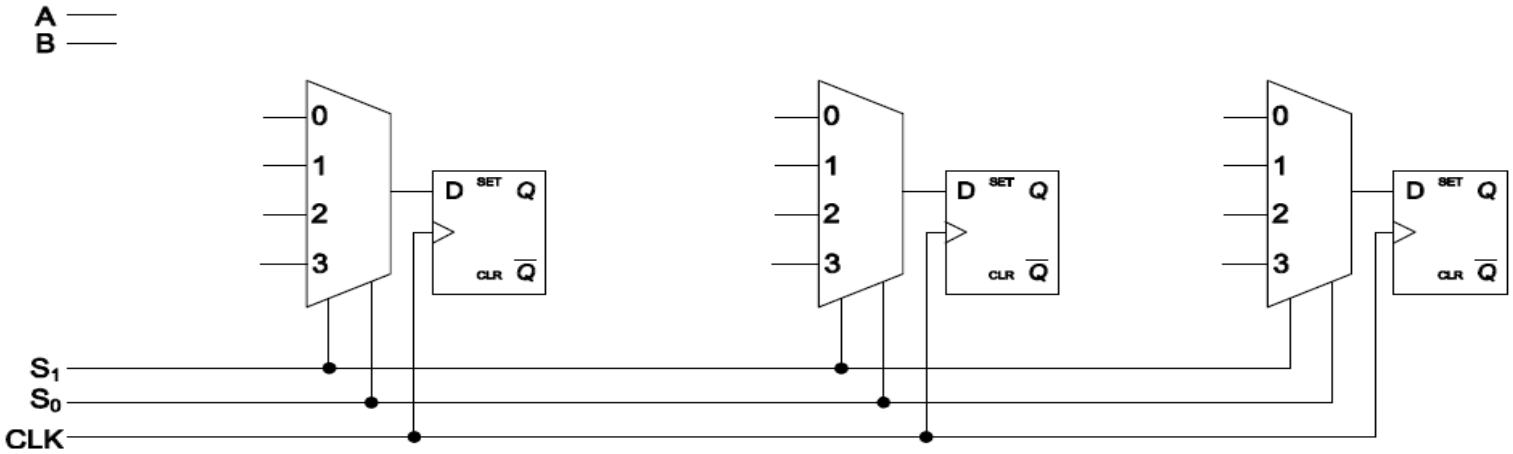
Today

- Sequential Circuits
  - Shift Register Exercise
  - Combination Lock (Preparation Task) – discuss with tutors and others in your table/breakout room in zoom
  - Modifying the Combination Lock
- Make sure you know how to draw a circuit schematic diagram and simulate a circuit in Logisim. If you have doubts, ask questions to get clarification

complete the shift register design so that it implements the behaviour below



S_1S_0	Action when circuit is clocked
00	Bits shifted to right, value on A stored in leftmost flip-flop
01	All bit values are toggled
10	If B is 1, value from A stored in all flip-flops If B is 0, all flip-flops reset (i.e. 0 is stored in all flip-flops)
11	All bits are rotated to the left. (Bit in leftmost flip-flop is moved to rightmost flip-flop)



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Discuss Your Logic Diagrams and Circuit Schematics

- Check the logic diagram
  - Circuit functionality – will it do what was asked?
- Check the circuit schematic
  - Naming of inputs and outputs
  - Identification of chips (U1, U2 etc) and gates within chips where applicable (:A, :B etc)
  - Identification of types of chips (74HCT00 etc.)
  - Numbering of pins
  - Power supply connections
- Check schematic guide and device pinouts on Blackboard for more details
- Ask a tutor if necessary
- Online sessions – talk to other people in your breakout room and discuss among yourselves and make sure you have the correct design on paper

Combination Lock Preparation Task

- **Test your design – either build or simulate in Logisim**

Modify the design – use fewer flip-flops

- On paper, have a design that detects sequence AC (hex). (Switches set to A (1010), clock push-button pressed. Switches set to C (1100), clock push-button pressed.)
  - Can you do it with 3 flip-flops? Can you do it with 2? (hint, can you move the registers towards output side)
- Simulate it with Logisim

Challenge task

- Allow the unlock combination to be set (stored in flip-flops) using switches/buttons
  - Simulate in Logisim