# National University of Computer and Emerging Sciences, Lahore Campus

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| | Course: | Digital Logic Design Lab | Course Code: | EL227 |
| | Program: | BS(Computer Science) | Semester: | Spring 2018 |
| | Duration: | 25 | Total Marks: | 10 |
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| | Section: | D-2 | Pages: | 2 |

**Question # 1**

Design a one-input, one-output serial 2's complementer. The circuit accepts a string of bits from the input and generates the 2's complement at the output.

**a.** Construct the state table that consists of the present state, inputs and next state.

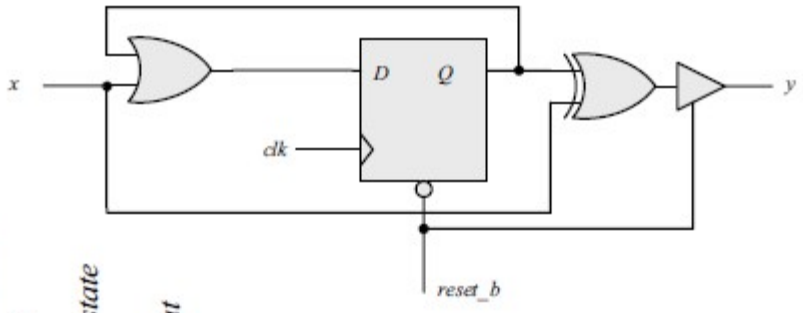
**b.** Derive the next state equation/equations. Also show the simplification.

**c.** Draw the logic diagram of sequential circuit.

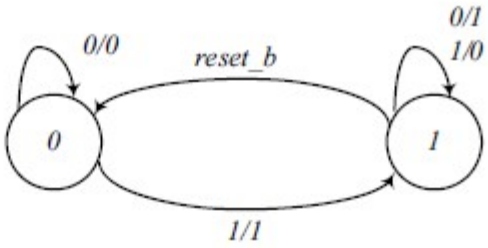
**d.** Draw the corresponding state diagram.

**Solution:**

The output is 0 for all 0 inputs until the first 1 occurs, at which time the output is 1. Thereafter, the output is the complement of the input. The state diagram has two states. In state 0: output = input; in state 1: output = input'.




| Present state | Input | Next state | Output |
|---|---|---|---|
| A | x | A | y |
| 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 |




$D_A = A + x$

$y = Ax' + A'x$