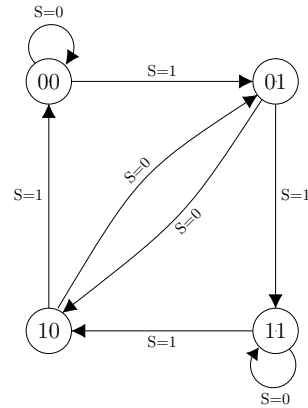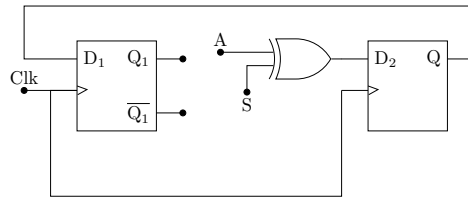# ASSIGNMENT 10

SUHANI KALRA

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1 Problem

1.1 EC GATE 2014

In the given circuit, if A is connected to Q1, the operation of the circuit is according to the state diagram. If XOR is replaced with XNOR, then to get the same operation of the circuit which of the following changes has to be done

1.2 circuit diagram

1.3 state diagram

(a) A should be connected to $\overline{Q1}$

(b) A should be connected to Q2

(c) A should be connected of Q1 and S is replaced $\overline{S}$ to $\overline{Q1}$

2 Solution

2.1 basic solution

- Initially,
  A=Q1 , $D2 = A \oplus S = Q1 \oplus S = Q1 + \bar{S}Q1$
  NOW,
  XOR GATE is replaced by X-NOR gate
  Let X is unknown
  So,
  $D2 = S \odot X = \bar{S}\bar{X} + SX$

- But Circits before and after must be same.
  So,
  $D2 = Q \odot S = Q1 \oplus S$
  $\overline{SX} + SX = \overline{Q1}S + \bar{S}Q1$

- Then operation does not change.By comparing above, unknown X must be equal to $\overline{Q1}$
  i.e. A must be connected to Q1
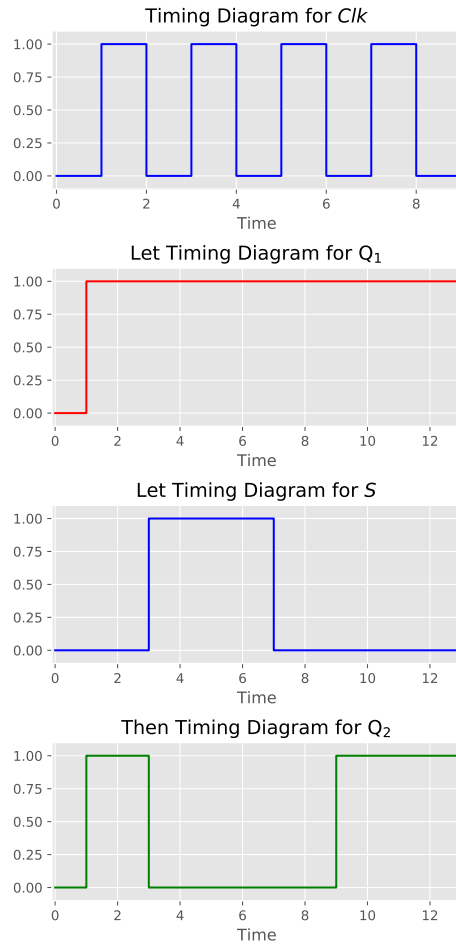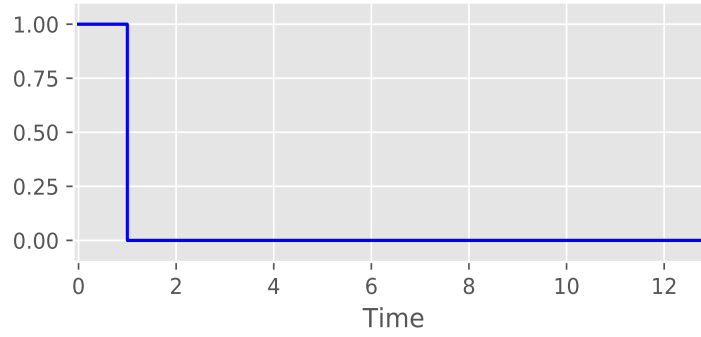
2.2   timing diagrams

Figure 2

to keep Q_2 as same as before $A = \overline{Q1}$ and $D2 = Q \odot$

Timing Diagram for $\overline{Q1}$

Timing Diagram for S