

EE348 Homework 1

Nail Tosun - 2094563
Electric and Electronic Engineering Department, METU

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Question 1

Part a

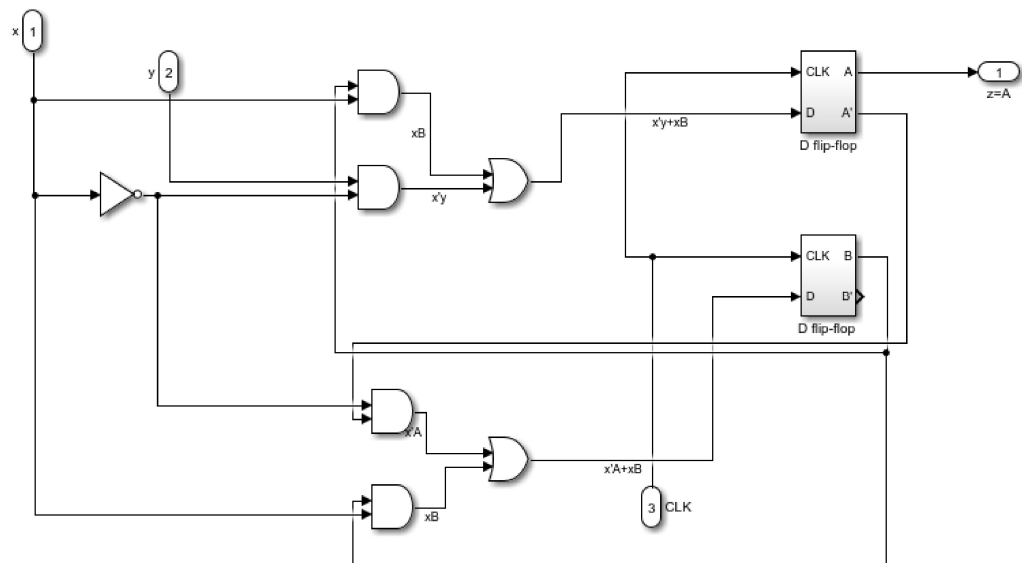


Figure 1: Logic diagram of the circuit

Part b

| Present State | | Input | | Next State | | output |
|---------------|---|-------|---|------------|---|--------|
| A | B | x | y | A | B | z |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 0 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Figure 2: State Table

Part c

Question 2

Part a

| Present State | | Input | Next State | | output |
|---------------|---|-------|------------|---|--------|
| A | B | x | A | B | z |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 | 0 | 1 |

Figure 3: State table of the logic circuit

Part b

| States | Output |
|--------|--------|
| 00 | 0 |
| 00 | 0 |
| 01 | 1 |
| 00 | 0 |
| 01 | 0 |
| 11 | 1 |
| 00 | 0 |
| 01 | 0 |
| 11 | 0 |
| 10 | 1 |
| 00 | 0 |
| 01 | 0 |
| 11 | 0 |
| 10 | 0 |
| 10 | 1 |
| 00 | |

Figure 4: States and output of the logic circuit

Question 3

$$A(n+1) = (A + B) \oplus A = A'B$$

$$B(n+1) = (A' + B) \oplus B = A'B'$$

| Present State | Next State |
|---------------|------------|
| 00 | 01 |
| 01 | 10 |
| 10 | 00 |
| 11 | 00 |

Figure 5: State table of the logic circuit

When we look at the state diagram i saw that circuit is 0 to 2 counter.

Question 4

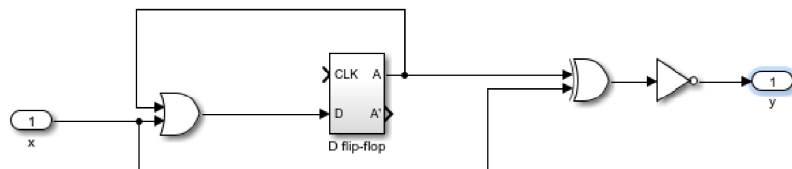


Figure 6: Design of 2's complementer

Calculations are in appendix.

Question 5

| Present State | | | Input | | Next State | | | Output |
|---------------|---|---|-------|---|------------|---|---|--------|
| A | B | C | x | A | B | C | y | |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | |
| 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | |
| 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | |
| 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | |
| 1 | 0 | 1 | 0 | x | x | x | x | |
| 1 | 0 | 1 | 1 | x | x | x | x | |
| 1 | 1 | 0 | 0 | x | x | x | x | |
| 1 | 1 | 0 | 1 | x | x | x | x | |
| 1 | 1 | 1 | 0 | x | x | x | x | |
| 1 | 1 | 1 | 1 | x | x | x | x | |

Figure 7: State table of the state diagram