Computer Architecture 1 Lab8 De Morgan’s Flip Flops

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1.

Prove the following theorems of De Morgan by completing the following tables.

In easysim, verify this theorem using appropriate circuits:

\_\_\_\_\_ \_\_ \_\_

(i) A + B = A . B

\_\_\_\_\_ \_\_ \_\_

(ii ) A . B = A + B

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| A | B | A+B | \_\_  A | \_\_  B | \_\_\_\_  A+B | \_\_ \_\_  A. B |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 |

### Circuit:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| A | B | \_\_  A | \_\_  B | A.B | \_\_\_\_  A. B | \_\_ \_\_  A + B |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 | 0 | 0 |

Circuit:2.

Design and simplify, using K-maps, a circuit for the following truth table.

Verify its operation in EasySim. Draw the K-map and circuit below:

**Truth Table:**

|  |  |  |  |
| --- | --- | --- | --- |
| **X** | **Y** | **Z** | **Output** |
| 0 | 0 | 0 | X |
| 0 | 0 | 1 | X |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | X |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

**K-Map:**

|  |  |  |
| --- | --- | --- |
| xy/z | 0 | 1 |
| 00 | x | x |
| 01 | 1 | X |
| 10 | 1 | 0 |
| 11 | 0 | 1 |

**Circuit**

3.

Describe, using your own words, a D Flip Flop. Illustrate how it is implemented below and confirm its operation using Easysim. Draw its truth table.

**Description:**

**Truth Table:**

**Circuit:**

4.

Show a circuit which can be used to write to a 4x4 memory.

Illustrate how it is implemented below and confirm its operation using Easysim.

You may use the blackbox for the decoder, which is a drop down option in Easysim.

**Description:**

**Circuit:**