



# North South University

## Department of Electrical & Computer Engineering

### Lab Report

Experiment No: 04

Experiment Title: Design of a 4-bit Binary Up-Down counter.

Course Code: CSE332L

Section: 10

Course Name: Computer Organization & Architecture Lab

Lab Group #: 03

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## Objectives:

(1) To build and understand the behaviour of an up/down counter

## Equipments List:

- Trainer Board
- IC 7404 (Not Gate), 7408 (AND Gate), 7432 (OR Gate), 7486 (XOR Gate), 7474 (D-FlipFlop)
- Wires for connection
- Power Supply

## Block Diagram:

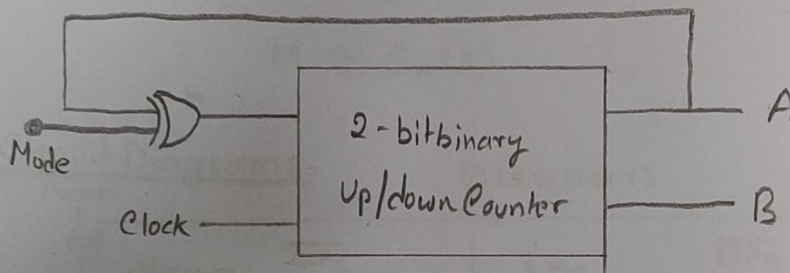


Fig: Block diagram of 2-bit binary up/down counter.

## Truth Table:

M	$Q_B(t)$	$Q_A(t)$	$Q_B(t+1)$	$Q_A(t+1)$	$T_B$	$T_A$
0	0	0	0	1	0	1
0	0	1	1	0	1	1
0	1	0	1	1	0	1
0	1	1	0	0	1	1
1	0	0	1	1	1	1
1	0	1	0	0	0	1
1	1	0	0	1	1	1
1	1	1	1	0	0	1



### k-map 8-

( $T_A$ )

M \ $Q_A$	00	01	11	10
0	1	1	1	1
1	1	1	1	1

$T_B$

M \ $Q_B Q_A$	00	01	11	10
0	0	1	1	0
1	1	0	0	1

### Boolean Expression 8-

$$T_A = 1$$

$$T_B = \overline{M} Q_A(t) + M \overline{Q}_A(t)$$

$$= M \oplus Q_A(t)$$

### Circuit Diagram 8-

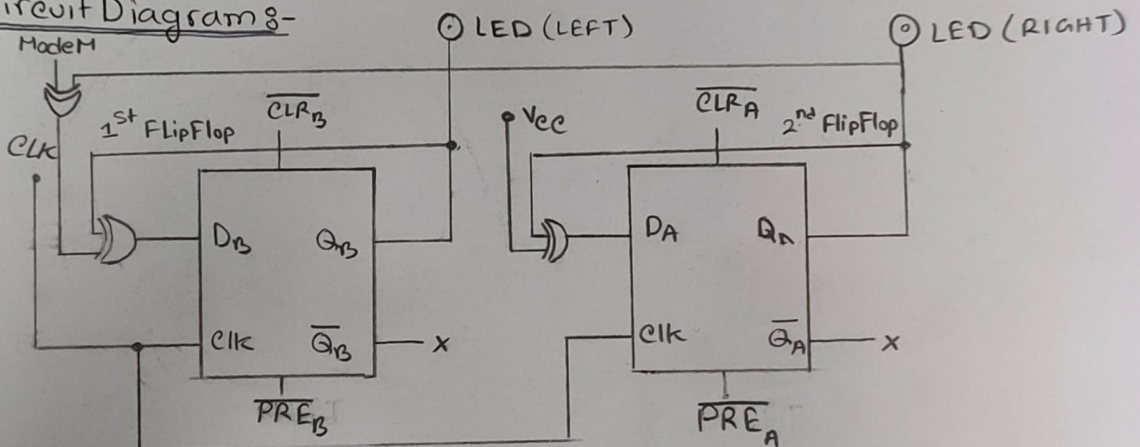
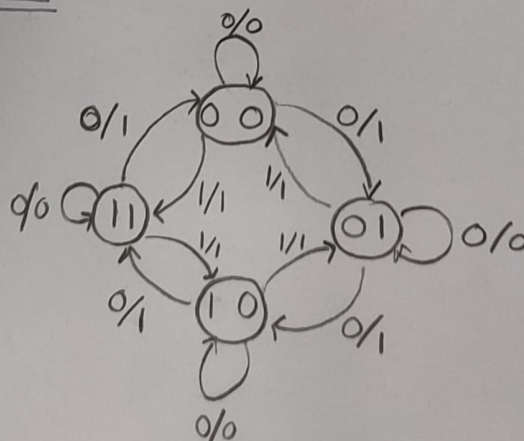


Fig: 2-Bit Binary Up/down Counter

### State Diagram 8

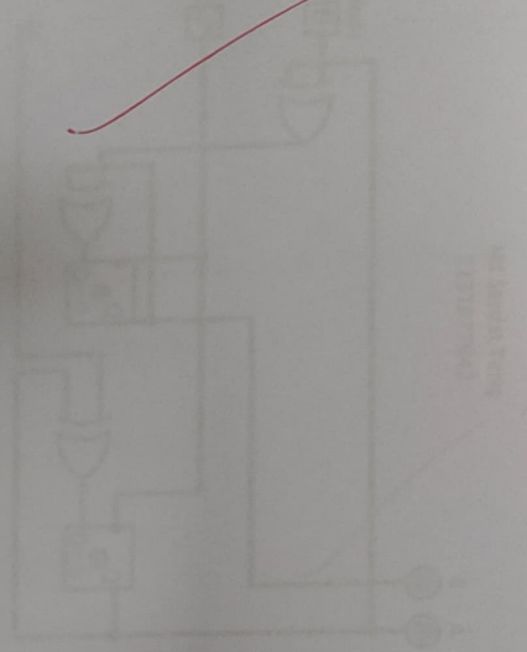
M/c

00



### Discussion:

In this experiment, we were to build a 2 bit-binary Up/down Counter but for the ease of understanding how the counter works we built a 2 bit-binary Up/down Counter. For this, we used the following ICs: IC 7404 (NOT Gate), IC 7408 (AND-Gate), IC 7432 (OR Gate), IC 7486 (XOR Gate) and finally IC 7474 (D-Flip Flop). This was a very straight forward circuit and was very easy to build. We didn't face any issues while implementing it. The experiment was successful.



Undo

main

Wiring

Splitter

Pin

Probe

Tunnel

Pull Resistor

1 - Constant

Clock

Power

Ground

Transistor

Transmission Gate

Bit Extender

Gates

NOT Gate

Buffer

AND Gate

OR Gate

NAND Gate

Circuit Name

main

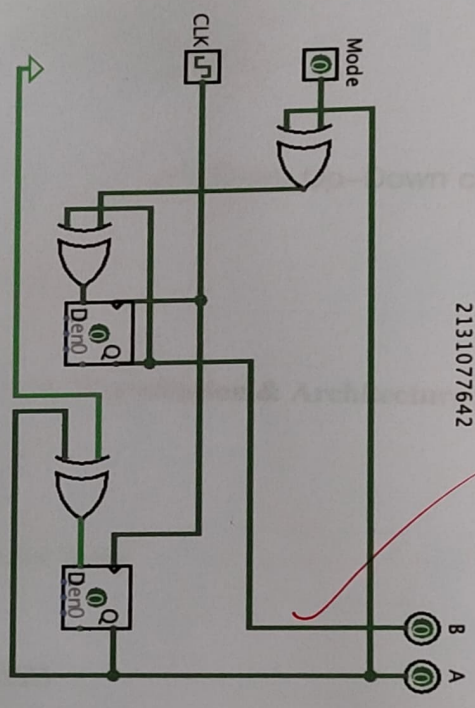
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