North South University

Department of Electrical & Computer Engineering

Lab Report

Experiment No: 04

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

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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:

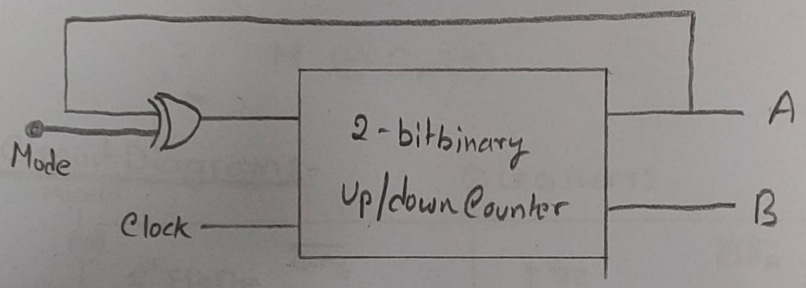


Fig: Block diagram of 2-bit binary up/down counter.

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 :-

(T_A)

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

$T(T_B)$

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

Boolean Expression :-

$$T_A = 1$$

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

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

Circuit Diagram :-

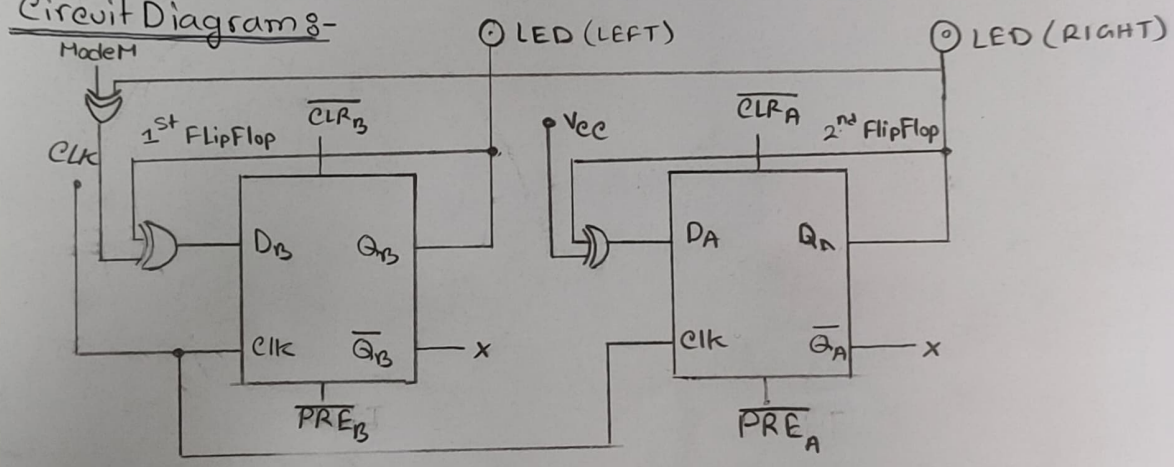
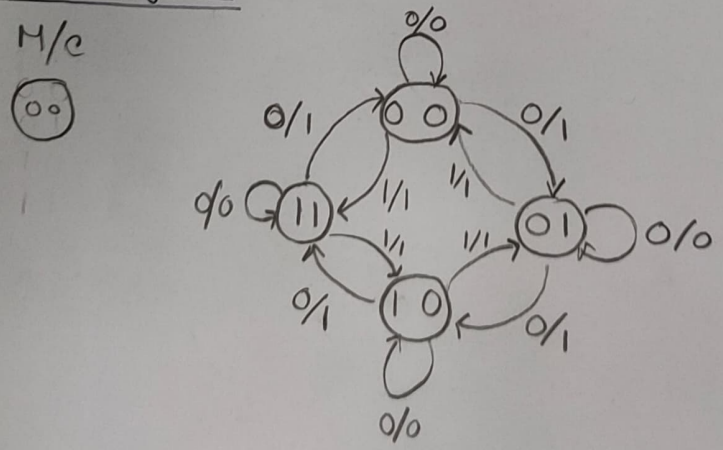


Fig: 2-Bit Binary Up/down Counter

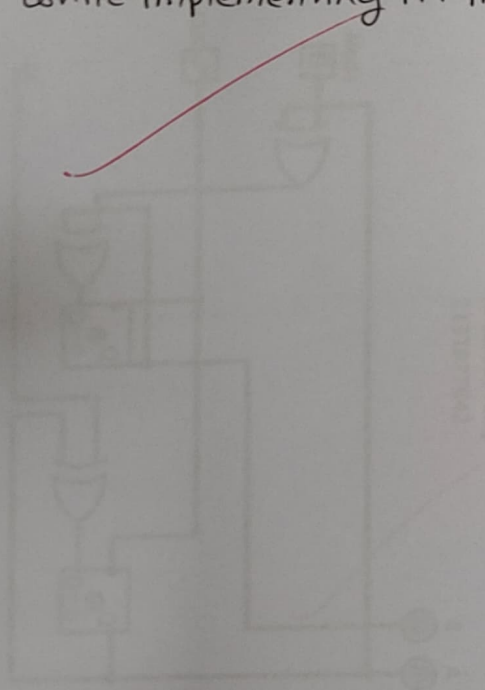
State Diagram :-

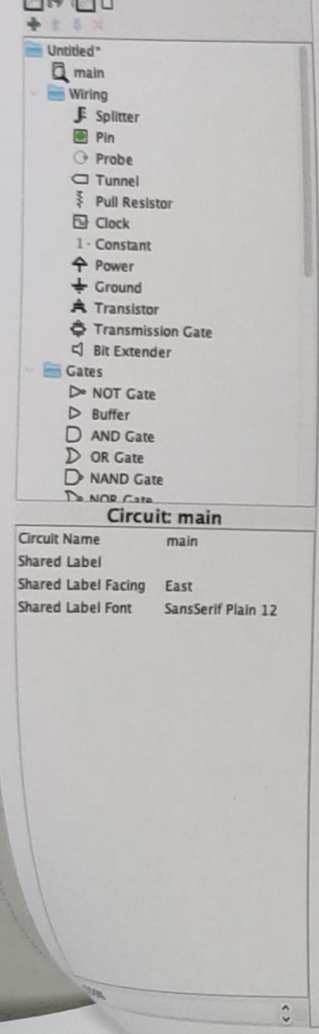
M/C



Discussion:

In this experiment, we were to build a 2 bit-binary Up/down counter but for the ease of understanding how the counter workes 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 (EXOR 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.





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