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CSC 211

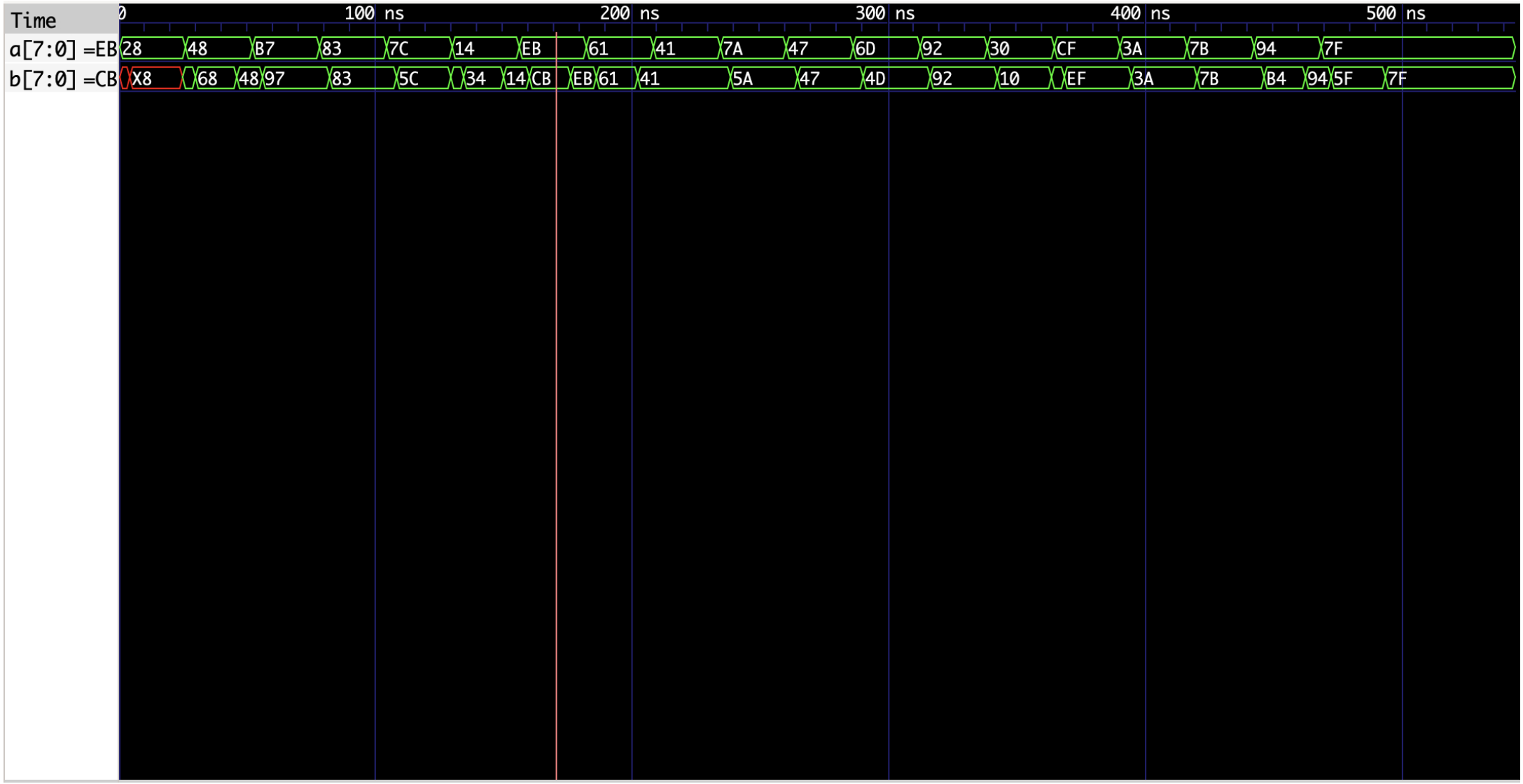
Project 1

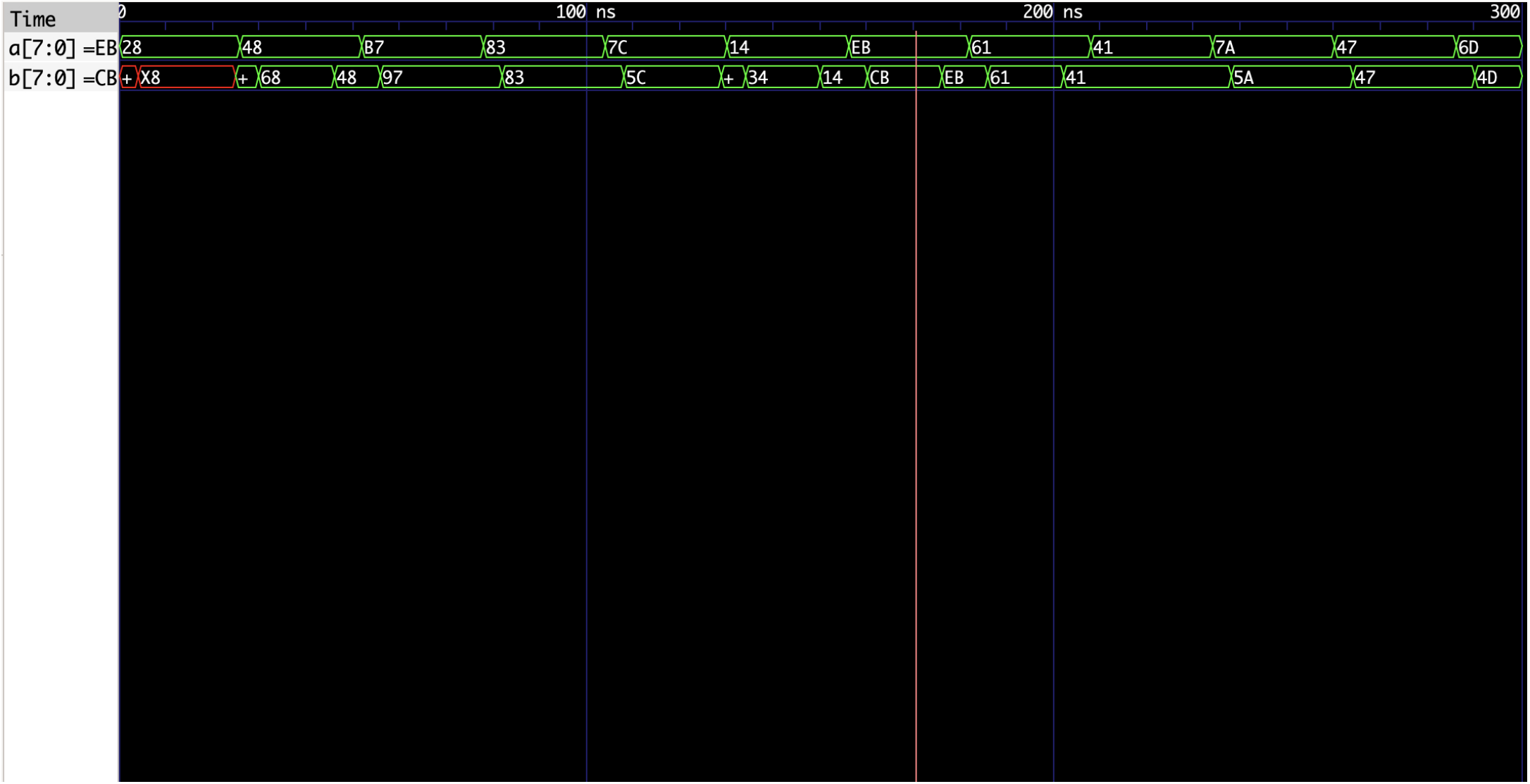
a[7:4] \ a[4:0]	0000	0001	0011	0010	0110	0111	0101	0100	1100	1101	1111	1110	1010	1011	1001	1000
0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0011	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0010	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0110	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0111	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0
0101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1010	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1011	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

- This project keeps bits all bits and changes bit 5, in order to capitalize an ascii character. Non letters dont need to change.
- The sum of the terms can be:
  1. a[7] a[5]
  2. na7, na6, a[5]
  3. na7, a[6], a[5], a[4], a[3], na2, a[1], a[0]
  4. na7, a[6], a[5], a[4], a[3], na2, a[1], a[0]
  5. na7, a[5], na4, na3, na2, na1, na0
- The sum of these can directly alter the 5th bit.
- Shown by the screenshots, the circuit takes 25ns to execute. Thus we need a 26 ns delay to see the change.

```
(base) apostolitsano@Apostolis-MacBook-Air-3 Project 1 % iverilog -o sim tb_toUp
per.v toUpper.v
vvp sim
VCD info: dumpfile toUpper.vcd opened for output.
tb_toUpper.v:53: $finish called at 525000 (1ps)
(base) apostolitsano@Apostolis-MacBook-Air-3 Project 1 %
```

26ns


Time
0
100 ns
200 ns
300 ns
400 ns
500 ns
a[7:0] =EB
28 48 B7 83 7C 14 EB 61 41 7A 47 6D 92 30 CF 3A 7B 94 7F
b[7:0] =CB
X8 68 48 97 83 5C 34 14 CB EB 61 41 5A 47 4D 92 10 EF 3A 7B B4 94 5F 7F


Time
0
100 ns
200 ns
300
a[7:0] =EB
28
48
B7
83
7C
14
EB
61
41
7A
47
6D
b[7:0] =CB
+
X8
+
68
48
97
83
5C
+
34
14
CB
EB
61
41
5A
47
4D


Time
0
100 ns
200 ns
300 ns
400 ns
500 ns
a[7:0]
28 48 B7 83 7C 14 EB 61 41 7A 47 6D 92 30 CF 3A 7B 94 7F
b[7:0]
X8 68 + 97 83 5C 34 + CB + 61 41 5A 47 4D 92 10 EF 3A 7B B4 + 5F 7F
This is 25ns


From: 0 sec
To: 25 ns
Marker 7 380 ps | Cursor 2 420 ps
Time
a[7:0] =28
b[7:0] =X8
0
10 ns
20 ns
28
xx
X8