

CORDIC

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- ⑧ DIRECT DIGITAL SYNTHESIS (DDS)

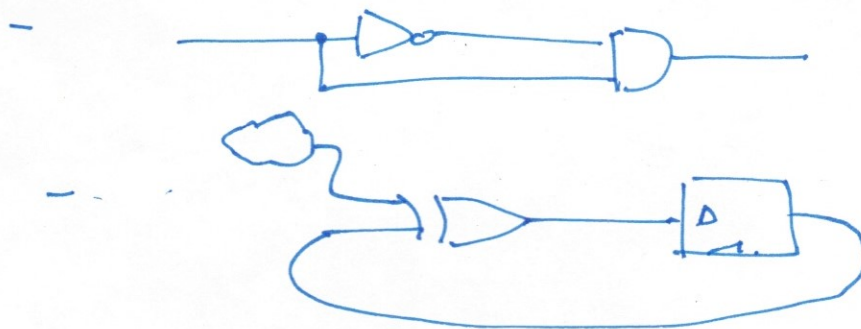
OPERATORS

- SEE IEEE 1364

- X, Z

AND

	0	1	X	Z
0	0	0	0	0
1	0	1	X	X
X	0	X	X	X
Z	0	X	X	X



SIGNED COMPUTATIONS

REG
WIRE

WIRE [1:0] a

\$SIGNED(a)

a	VALUE	VALUE
00	0	0
01	1	1
10	2	-2
11	3	-1

WIRE SIGNED [1:0] a

a	VALUE
00	0
01	1
10	-2
11	-1

EXAMPLE : COMPARISON

a	b	\$SIGNED(a) < \$SIGNED(b)
00	10	FALSE

a < B
TRUE

ARITHMETIC SHIFT

a
100

a >>> 1

010

\$SIGNED(a) >>> 1

110

③ PRECISION

TABLE 5-22

IEEE 1369

RULE: RESULT HAS SAME PRECISION AS OPERAND

WIRE [5:0] a, b;

$a + b \rightarrow$ 6 BIT PRECISION

$\{0, a\} + b \rightarrow$ 7 BIT PRECISION

④ SYNTHESIS

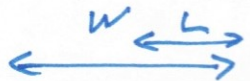
⑤ FIXED POINT COMPUTATION



0 → 15
0 → 7, -8 → -1

UNSIGNED

SIGNED



$2^1 \ 2^0 \ 2^{-1} \ 2^{-2}$
 $2 \ 1 \ \frac{1}{2} \ \frac{1}{4}$

1100 → 3

0101 → 1.25

$\langle W, L \rangle$

$\langle 4, 2 \rangle$

$$\frac{(0101)_2 = 5}{2^L} = \frac{5}{2^2} = 1.25$$

0.3 → FIXP in $\langle 4, 2 \rangle$?

$$0.3 \times 2^L = 0.3 \times 2^2 = 0.3 \times 4 = 1.2$$



1.2 → < 4, 2 >

$$1.2 \times 2^2 = 1.2 \times 4 = 4.8$$

↓
5

0100

110110