HW01 CS220

Legend:

Nand   Not   And

Or   Xor
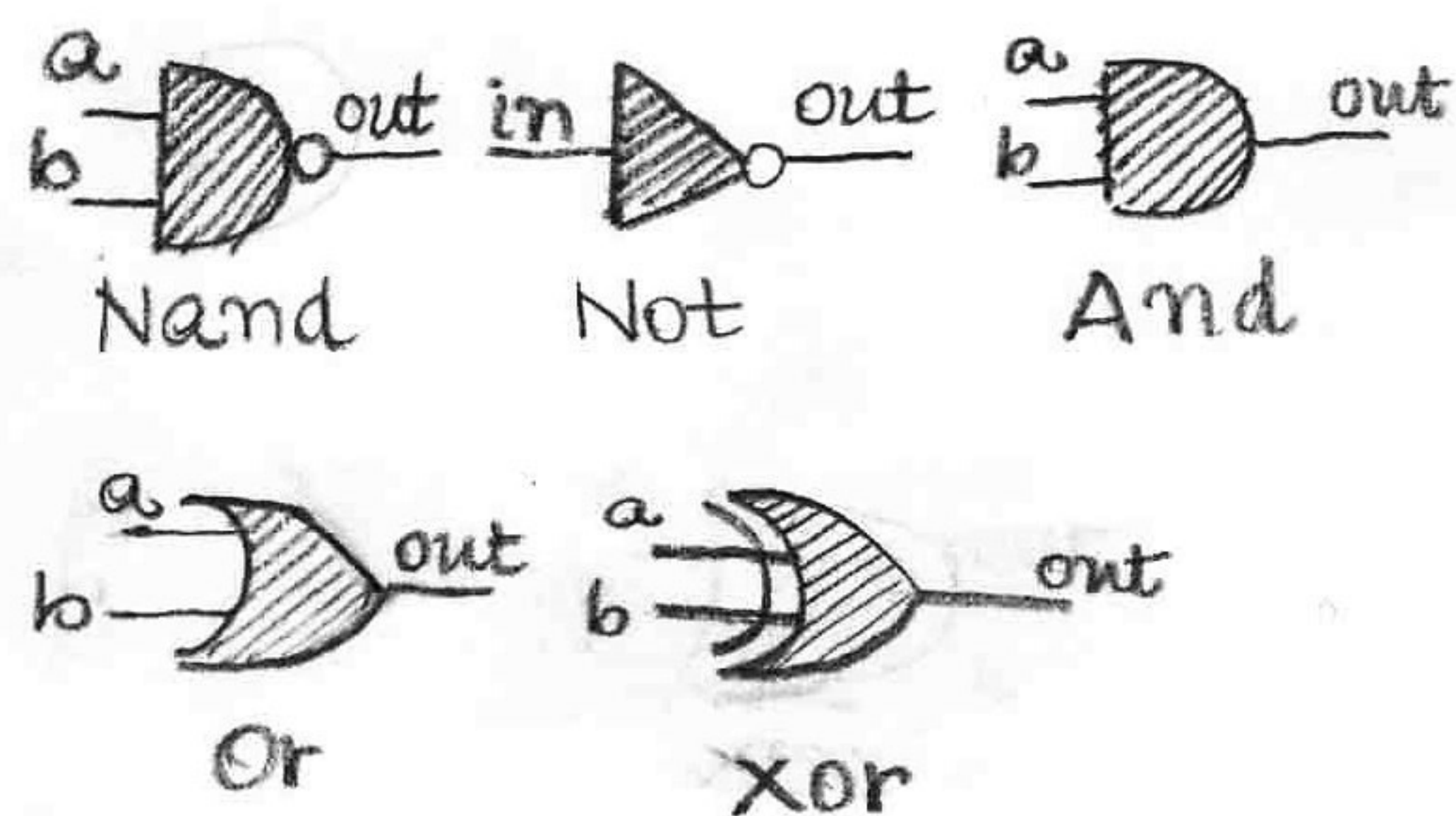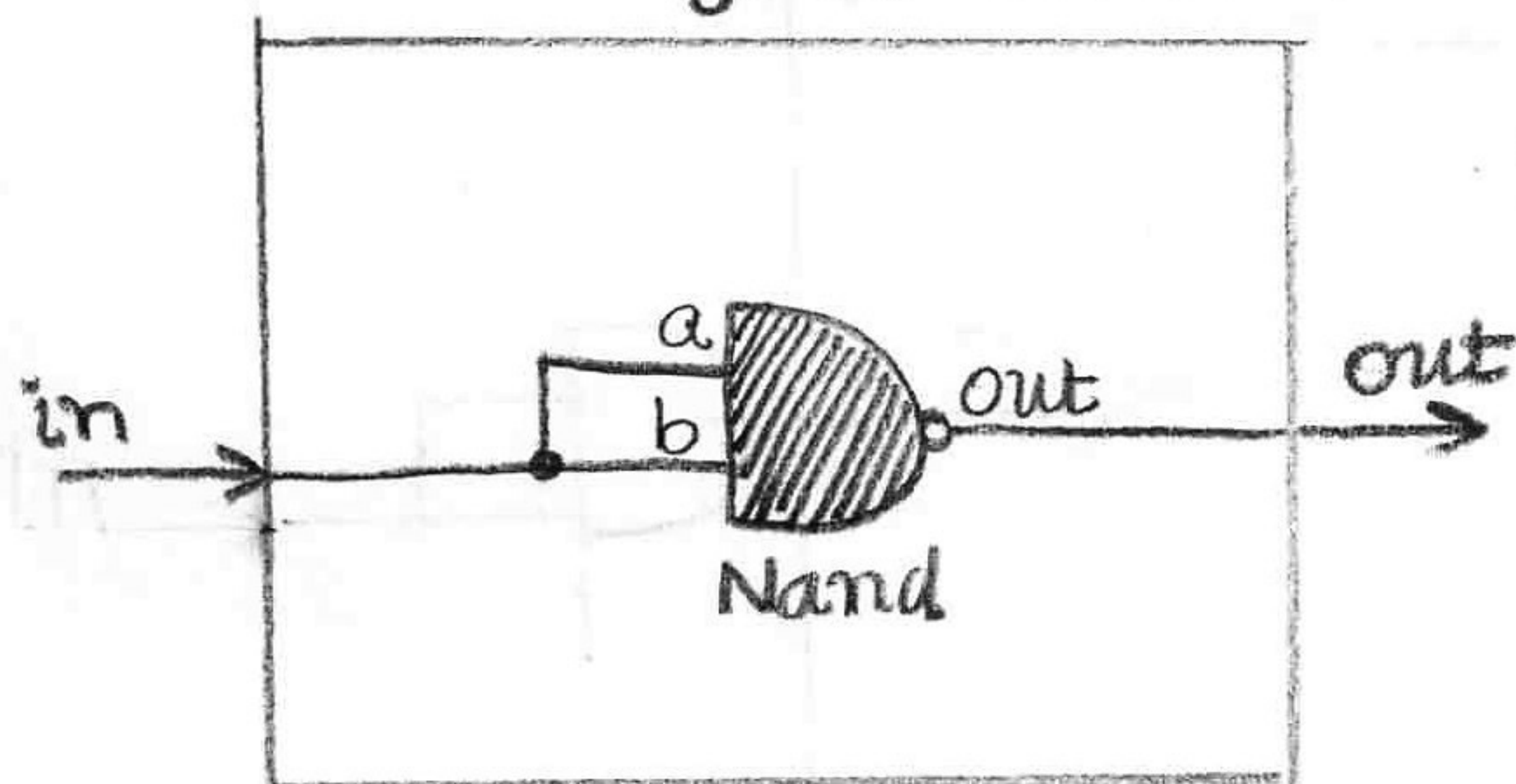
Homework 01
CS 220 – Computer Architecture + Machine Language

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Section: 2653 M/W 3:30 PM – 5:20 PM
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Not gate

input-output

1	0
0	1

$Not(a) = Nand(a, a)$

```
Not {
    IN in;
    OUT out;

    Nand(a = in, b = in, out = out);
}
```

And gate
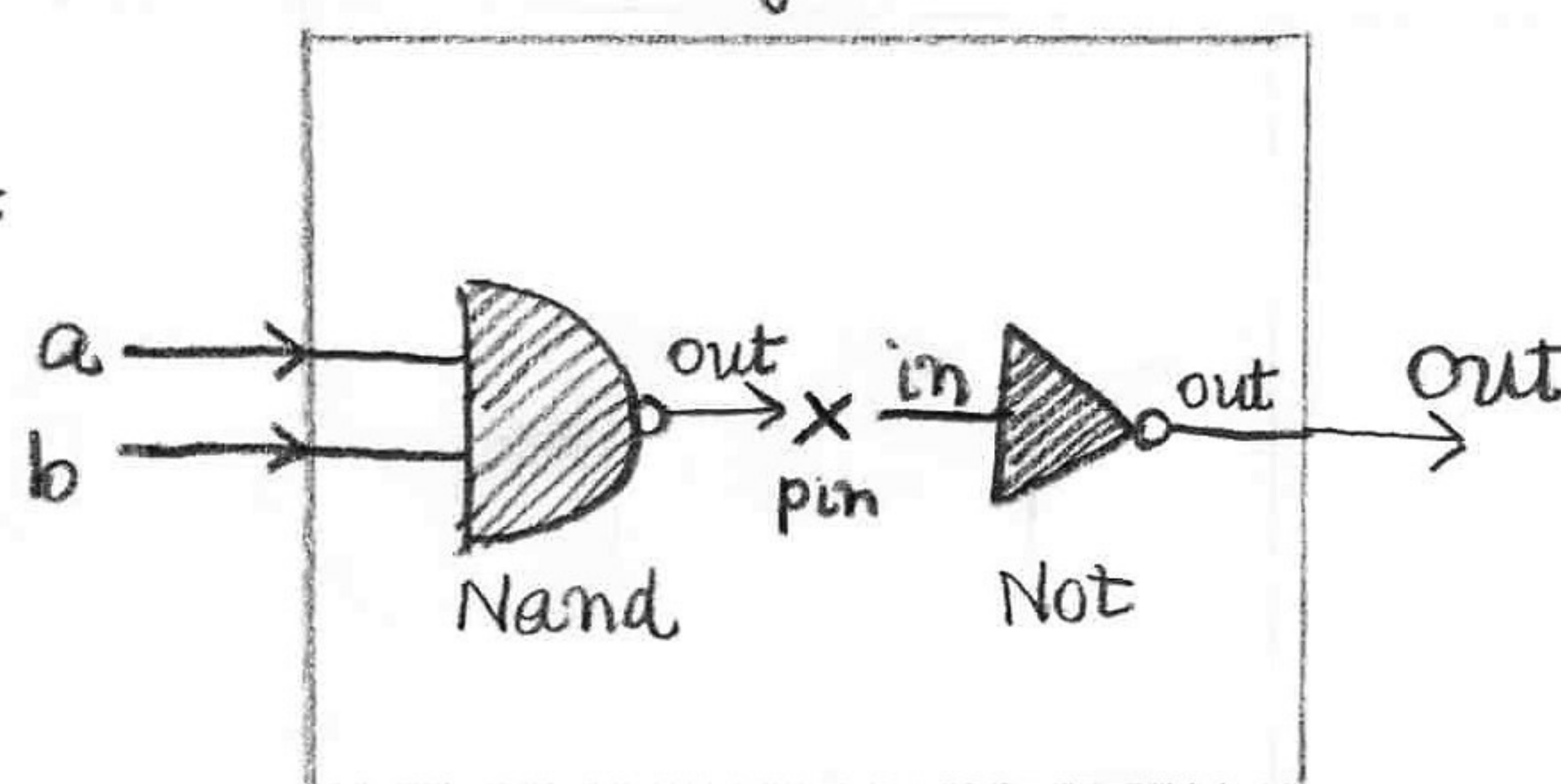
input - Output

0	0	0
1	0	0
0	1	0
1	1	1

$And(a, b) = Not(Nand(a, b))$

```
And {
    IN a, b;
    OUT out;

    Nand(a = a, b = b, out = x);
    Not(in = x, out = out);
}
```

Or gate
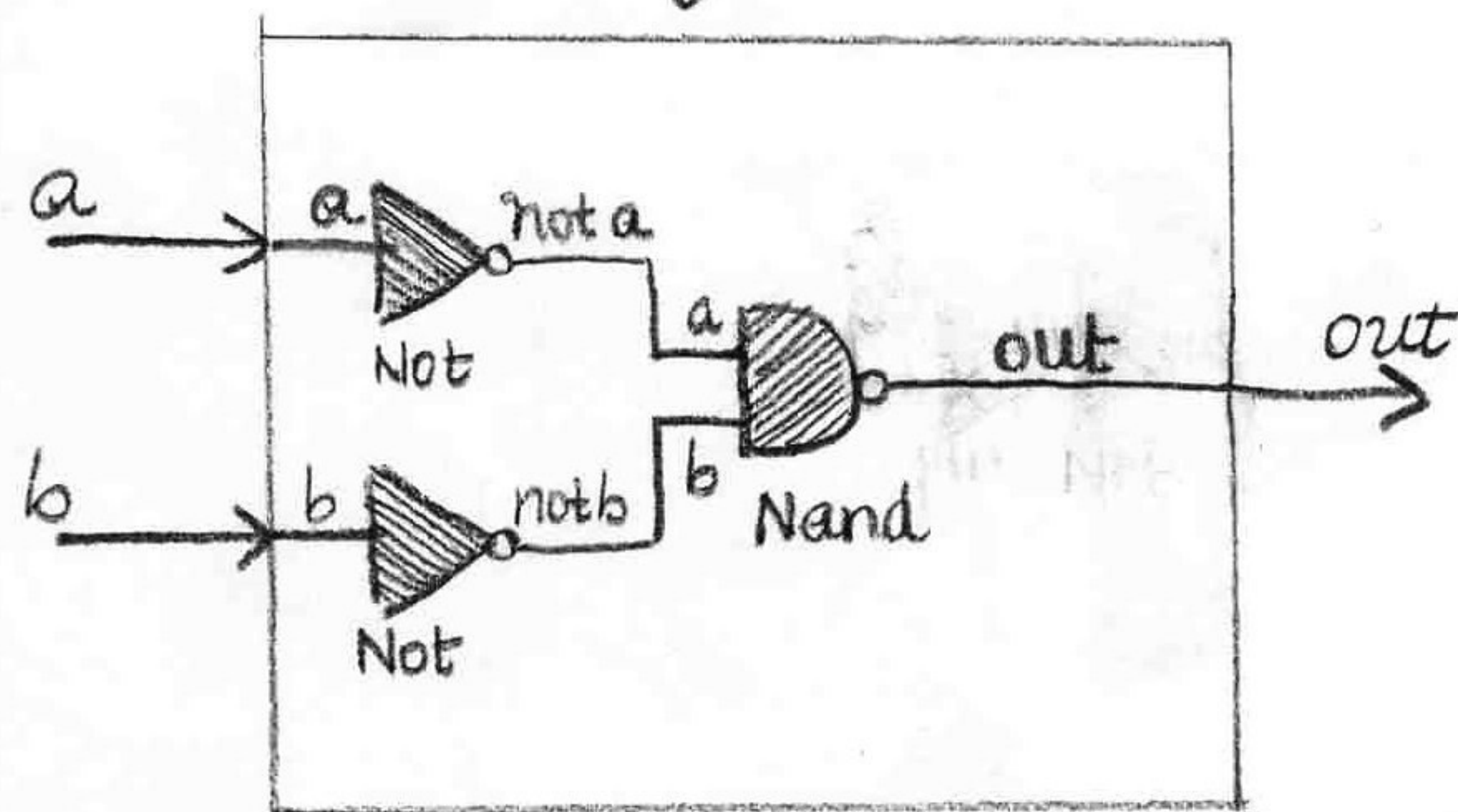
input - output

0	0	0
1	0	1
0	1	1
1	1	1

$Or(a, b) = Not(And(Not(a), Not(b)))$

```
Or {
    IN a, b;
    OUT out;

    Not(in = a, out = nota);
    Not(in = b, out = notb);
    Nand(a = nota, b = notb, out = out);
}
```

Xor gate
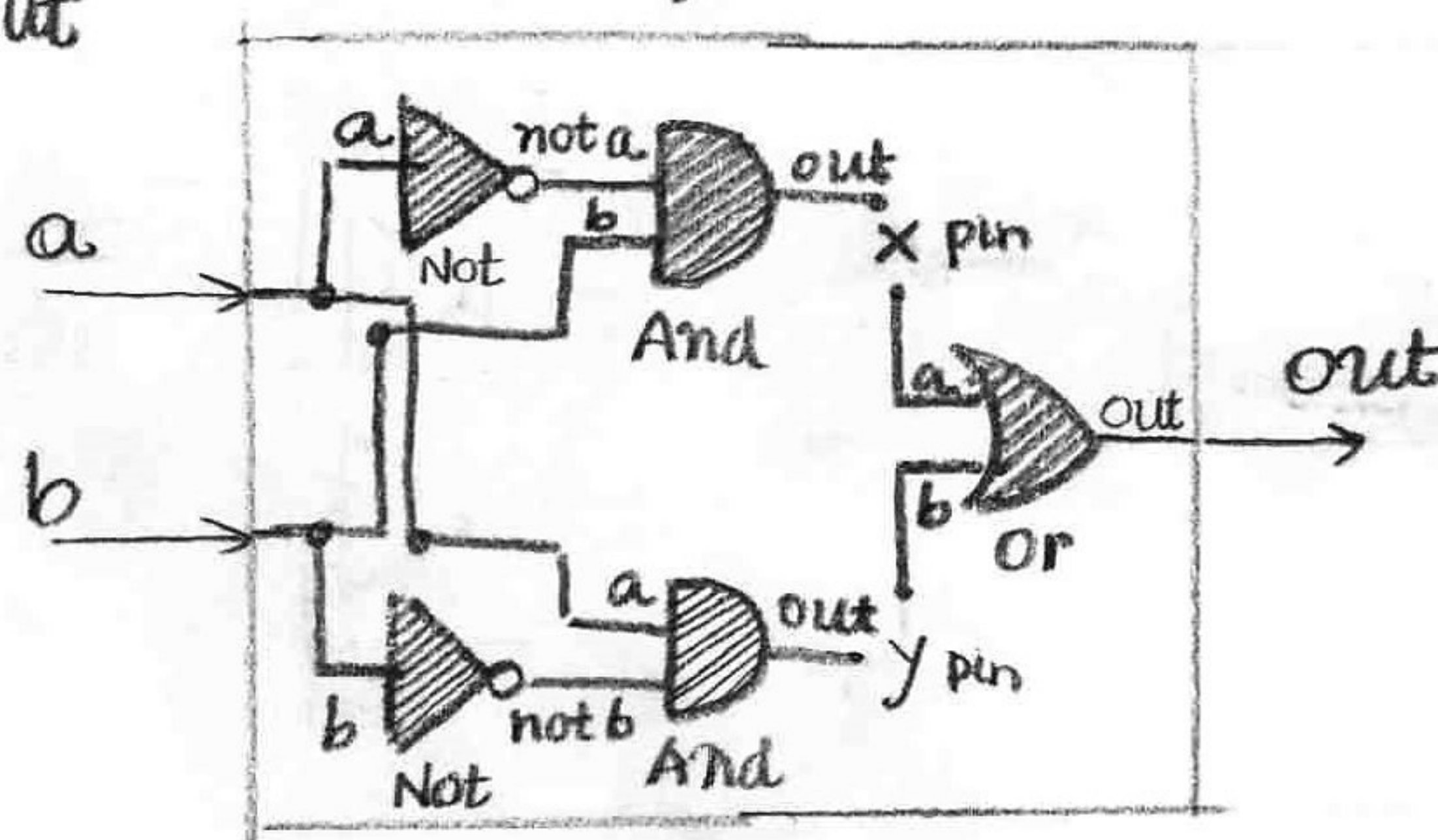
input - output

0	0	0
1	0	1
0	1	1
1	1	0

$Xor(a, b) = Or(And(a, Not(b)), And(Not(a), b))$

```
XOR {
    IN a, b;
    OUT out;

    Not(in = a, out = nota);
    Not(in = b, out = notb);
    And(a = a, b = notb, out = x);
    And(a = nota, b = b, out = y);
    Or(a = x, b = y, out = out);
}
```