Template Week 2 – Logic

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Use chatCpt for better English writing

Assignment 2.1: Parking lot

Which gates do you need?

We need (AND) gate because it precisely models the condition where all parking spot are occupied (all inputs = 1), and it ensures the “FULL” sign is activated in this case.

Complete this table

Parking lot 1	Parking lot 2	Parking lot 3	Result (full)
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Assignment 2.2: Android/iPhone

Which gates do you need?

XOR gate, the XOR gate outputs 1 when exactly one input is 1, and outputs 0 if both inputs are 0 or both are 1, this models this condition when the employee can pick only one phone.

Complete this table

Android phone	iPhone	Result (Phone in possession)
0	0	0
0	1	1
1	0	1
1	1	0

Assignment 2.3: Four NAND gates

Complete this table

A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0

How can the design be simplified?

1.The first NAND gate receives A,A which produces: NAND(A,A) = -A

So its output is -A (NOT A)

2. similarly , the second NAND gate receives B , B producing : NAND (B,B) = -B

So its output is -B (not B)

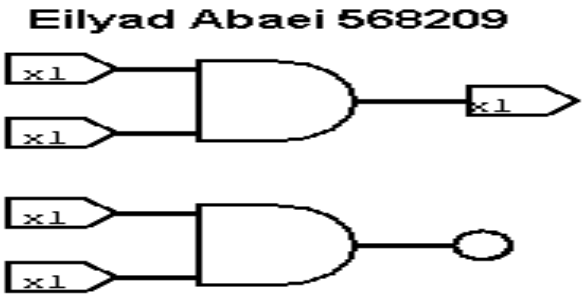
3. the third NAND gate receives the outputs -A,-B , producing: NAND (-A , -B) = -(-A , -B)

4. the fourth NAND gate combines the output A+B and the input form an earlier stage to produces Q.

Simplifying, we find that Q is equivalent to A.B, as the logic design mimics and AND gate.

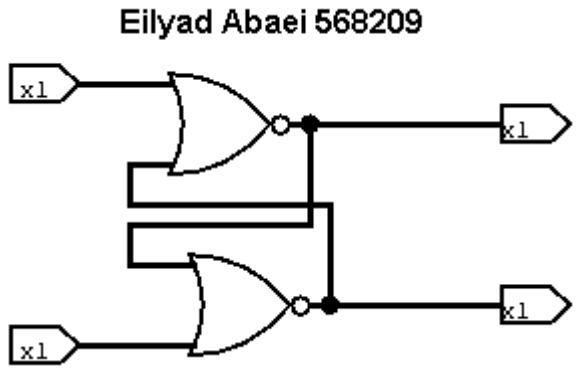
Assignment 2.4: Getting to know Logisim evolution

Screenshot of the design with your name and student number in it:



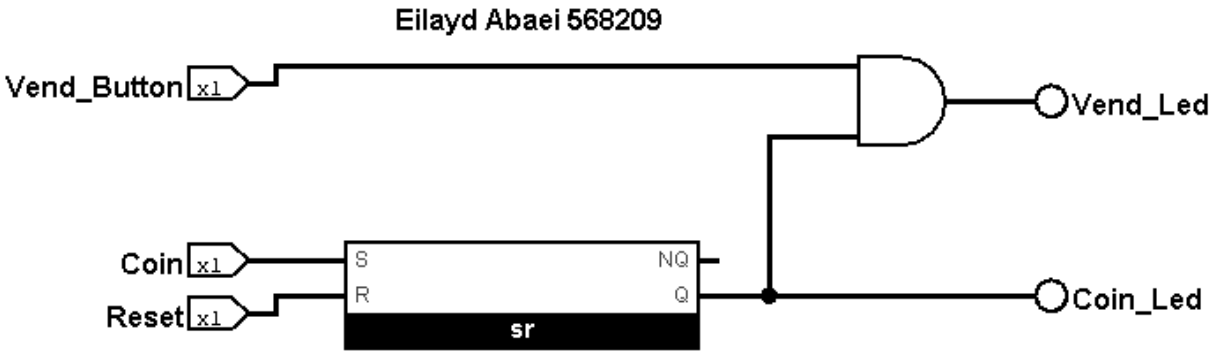
Assignment 2.5: SR Latch

Screenshot SR Latch in Logisim with your name and student number:



Assignment 2.6: Vending Machine

Screenshot Vending Machine in Logisim with your name and student number:



Bonus point assignment – week 2

Create a java program that accepts user input and presents a menu with options.

1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?

4. Implement the methods by using the bitwise operators you have just learned.

Organize your source code in a readable manner with the use of control flow and methods.

Paste source code here, with a screenshot of a working application

```
public class Main {
  public static void main(String[] args) {
    int number = 121;
    if((number&1)==1){
    System.out.println(" number is odd" );
    }else{
    System.out.println(" number is even" );
    }
  }
}
```

```
number is odd
```

```
public class Main {
  public static void main(String[] args) {
    int number = 4;

    if ((number & (number - 1)) == 0 && number > 0) {
      System.out.println("power of two");
    } else {
      System.out.println("not power of two");
    }
  }
}
```

```
not power of two
```

```
public class Main {
  public static void main(String[] args) {
      int number = 5;
   int result = (~number +1);
   System.out.println(result);
  }
}
```

```
-5
```