Template Week 2 – Logic

Student number: 566040

Assignment 2.1: Parking lot

Which gates do you need?

To indicate when all three parking spaces are occupied, we need an **AND gate**. An AND gate will output a high signal only if all three inputs (parking spaces) are high.

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?

The appropriate logic gate for this scenario is the XOR (Exclusive OR) gate. The XOR gate outputs true if and only if one of the inputs is true, but not both.

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	0
0	1	1
1	0	1
1	1	0

How can the design be simplified?

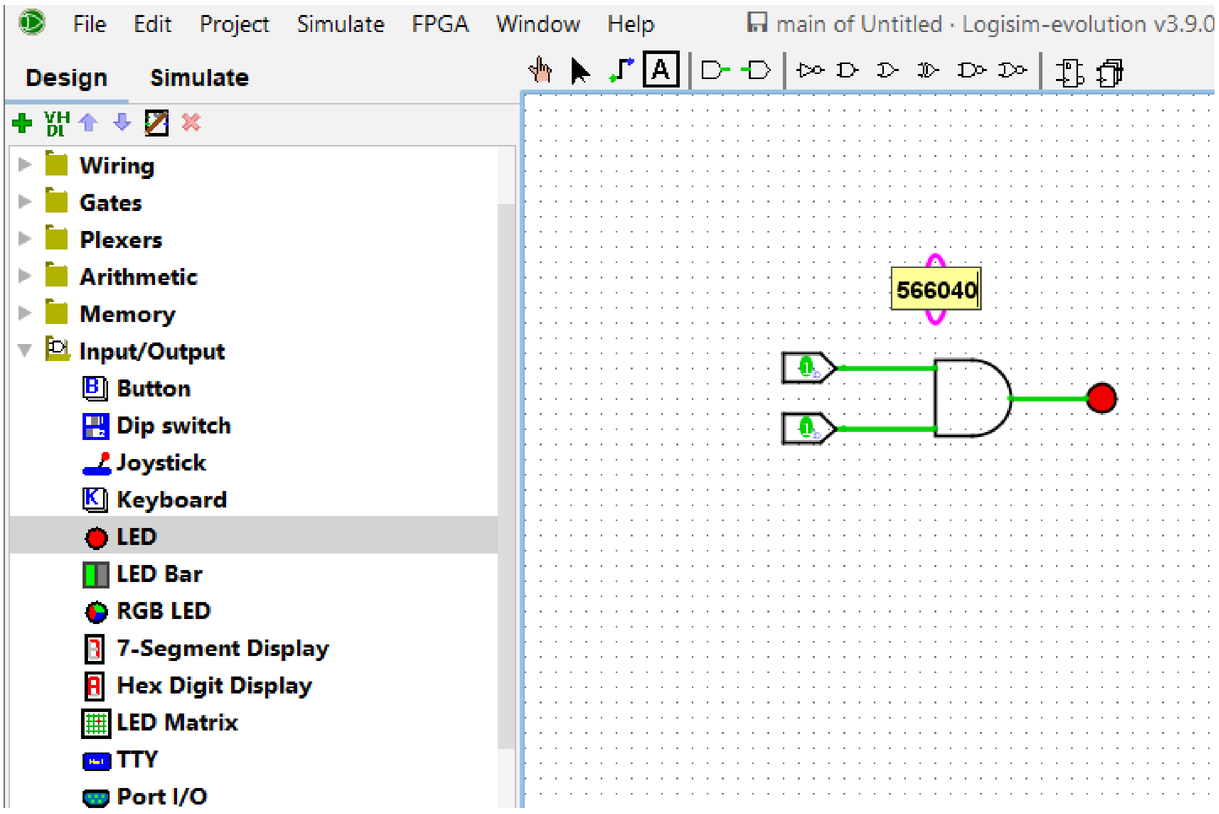
The given circuit can be simplified by directly using an XOR gate, which combines the logic of multiple NAND gates into a single gate. This will reduce the complexity of the design:

- **Original Design**: Uses multiple NAND gates to implement the XOR logic.
- **Simplified Design**: Use a single XOR gate.

This simplification reduces the number of gates and connections needed, making the circuit more efficient and easier to understand.

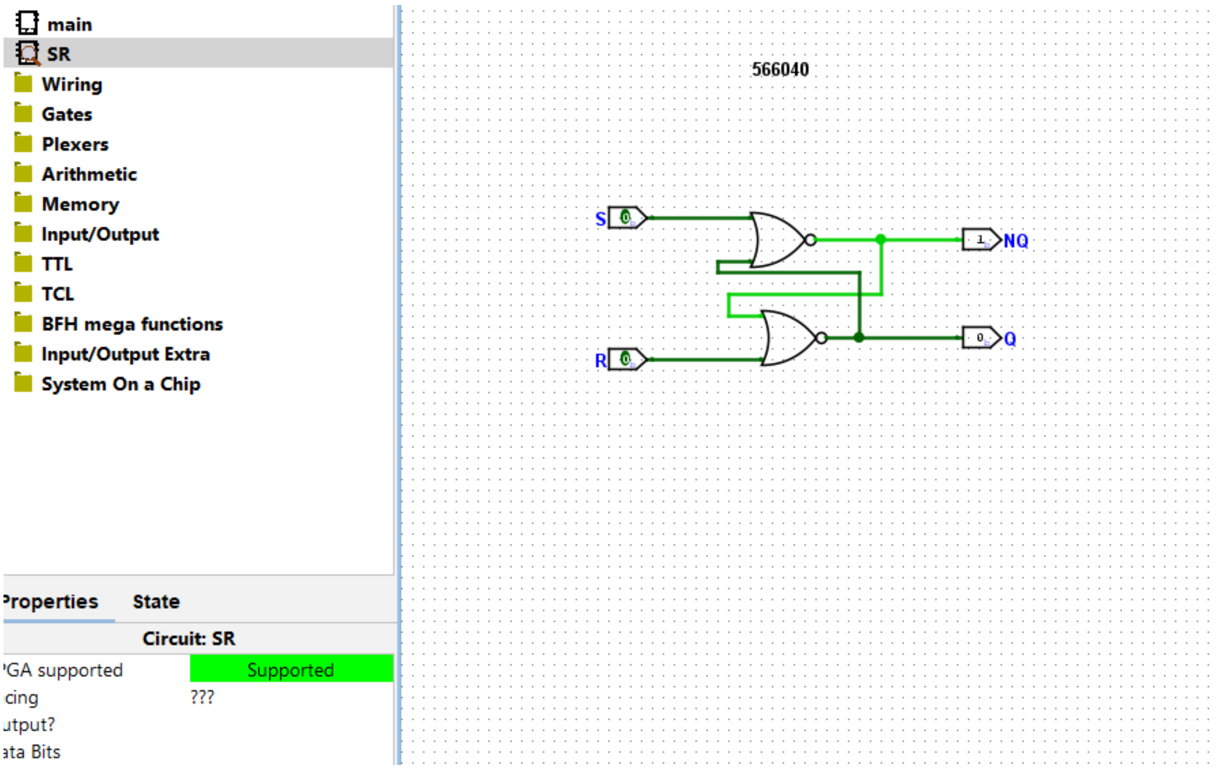
Assignment 2.4: Getting to know Logisim evolution

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:



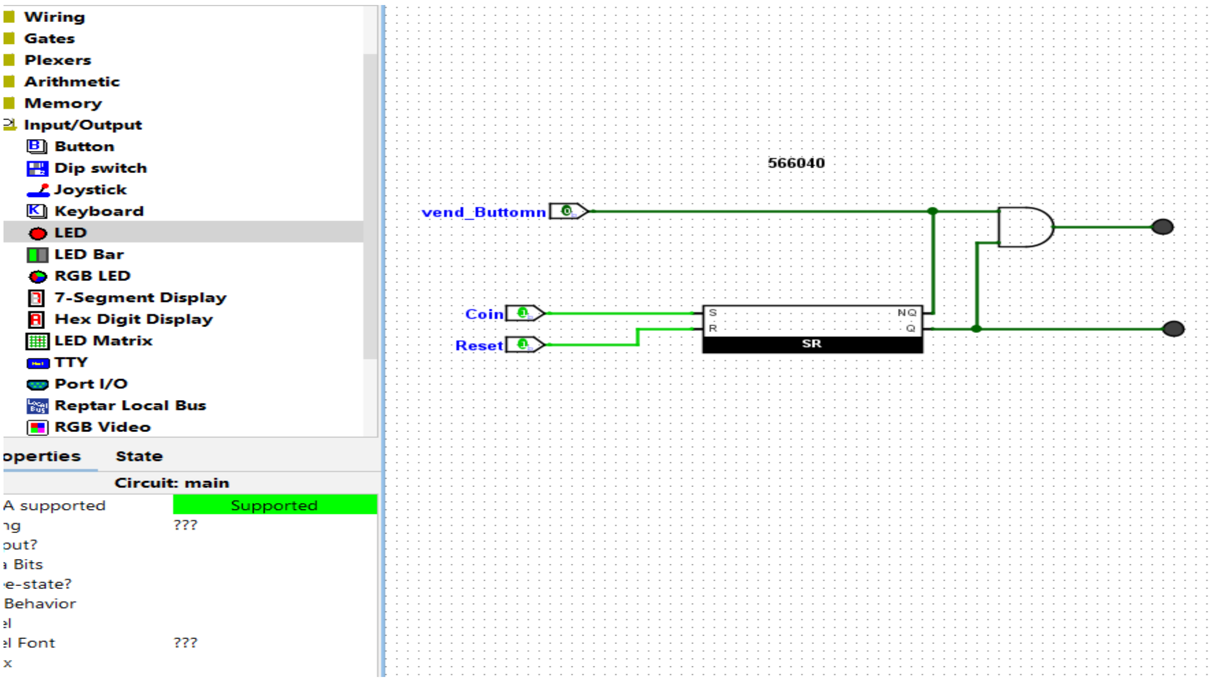
ʼroperties State

Circuit: SR

ʼGA supported	Supported
cing	???
ıtput?	
ıta Bits	

Assignment 2.6: Vending Machine

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



operties State

Circuit: main

A supported	Supported
ıg	???
out?	
ı Bits	
e-state?	
Behavior	
el	
el Font	???
x	

Bonus point assignment – week 2

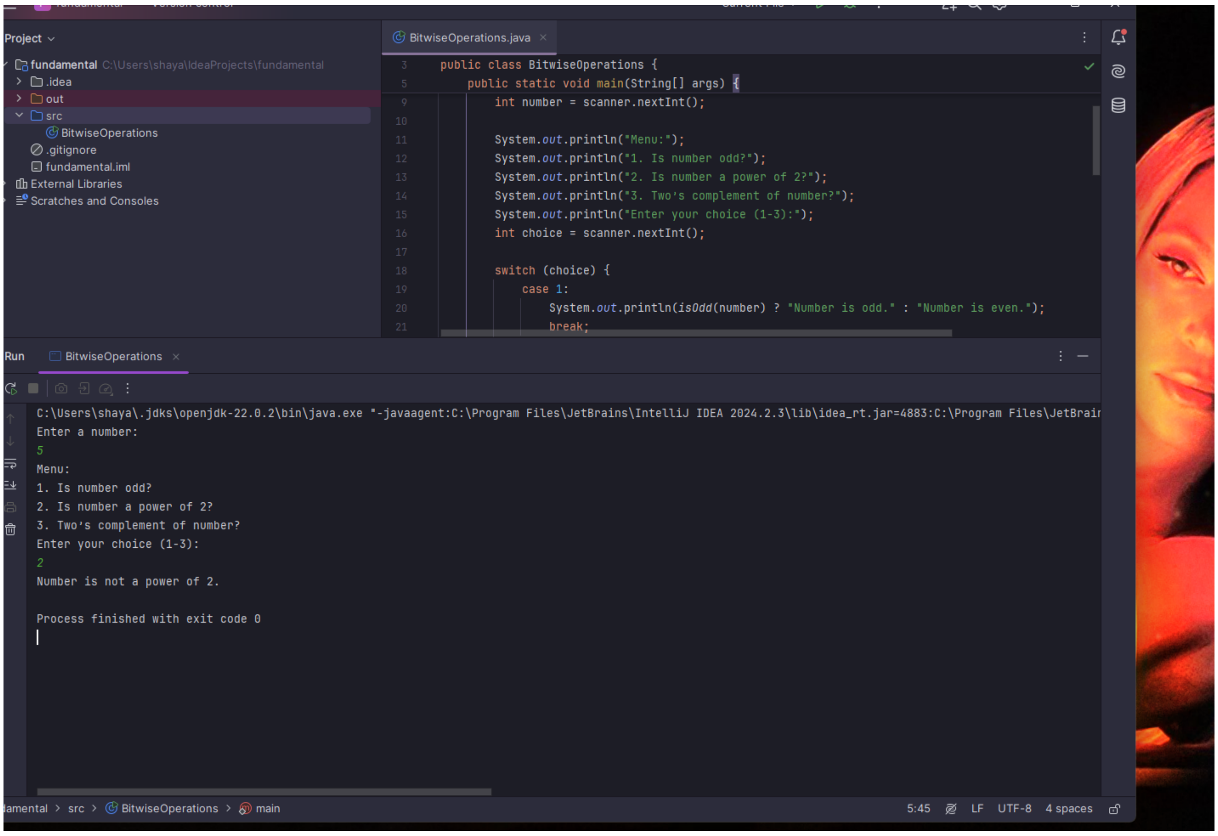
Create a java program that accepts user input and presents a menu with options.

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

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.



```java
public class BitwiseOperations {
    public static void main(String[] args) {
        int number = scanner.nextInt();

        System.out.println("Menu:");
        System.out.println("1. Is number odd?");
        System.out.println("2. Is number a power of 2?");
        System.out.println("3. Two's complement of number?");
        System.out.println("Enter your choice (1-3):");
        int choice = scanner.nextInt();

        switch (choice) {
            case 1:
                System.out.println(isOdd(number) ? "Number is odd." : "Number is even.");
                break;
```

```
C:\Users\shaya\.jdks\openjdk-22.0.2\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2024.2.3\lib\idea_rt.jar=4883:C:\Program Files\JetBrair
Enter a number:
5
Menu:
1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?
Enter your choice (1-3):
2
Number is not a power of 2.

Process finished with exit code 0
```

```java
import java.util.Scanner;


public class BitwiseOperations {


    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);


        System.out.println("Enter a number:");
        int number = scanner.nextInt();


        System.out.println("Menu:");
        System.out.println("1. Is number odd?");
        System.out.println("2. Is number a power of 2?");
        System.out.println("3. Two's complement of number?");
        System.out.println("Enter your choice (1-3):");
        int choice = scanner.nextInt();
        switch (choice) {
            case 1:
                System.out.println(isOdd(number) ? "Number is odd." : "Number is even.");
                break;
            case 2:
                System.out.println(isPowerOfTwo(number) ? "Number is a power of 2." : "Number is not a power of 2.");
                break;
            case 3:
                System.out.println("Two's complement of number: " + twosComplement(number));
                break;
            default:
                System.out.println("Invalid choice.");
        }

        scanner.close();
    }

    // Method to check if number is odd using bitwise AND operator
    private static boolean isOdd(int number) {
        return (number & 1) == 1;
    }

    // Method to check if number is a power of 2 using bitwise AND operator
    private static boolean isPowerOfTwo(int number) {
        return number > 0 && (number & (number - 1)) == 0;
    }

    // Method to get two's complement using bitwise NOT and addition
    private static int twosComplement(int number) {
        return ~number + 1;
    }
}
```

Ready? Then save this file and export it as a pdf file with the name: **week2.pdf**