Template Week 2 – Logic

Student number:566741

Assignment 2.1: Parking lot

Which gates do you need?

For this circuit, we need an **AND gate**. This is because we only want the "full" sign to turn on when all three parking spaces are occupied. An AND gate works perfectly here since it will only output "1" (indicating full) when all inputs are 1 (all spaces occupied).

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? For this setup, we need an XOR gate (exclusive OR). This is because the employee can only pick one phone, either Android or iPhone, but not both. An XOR gate outputs "1" when only one of the inputs is 1, which is what we need here.

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

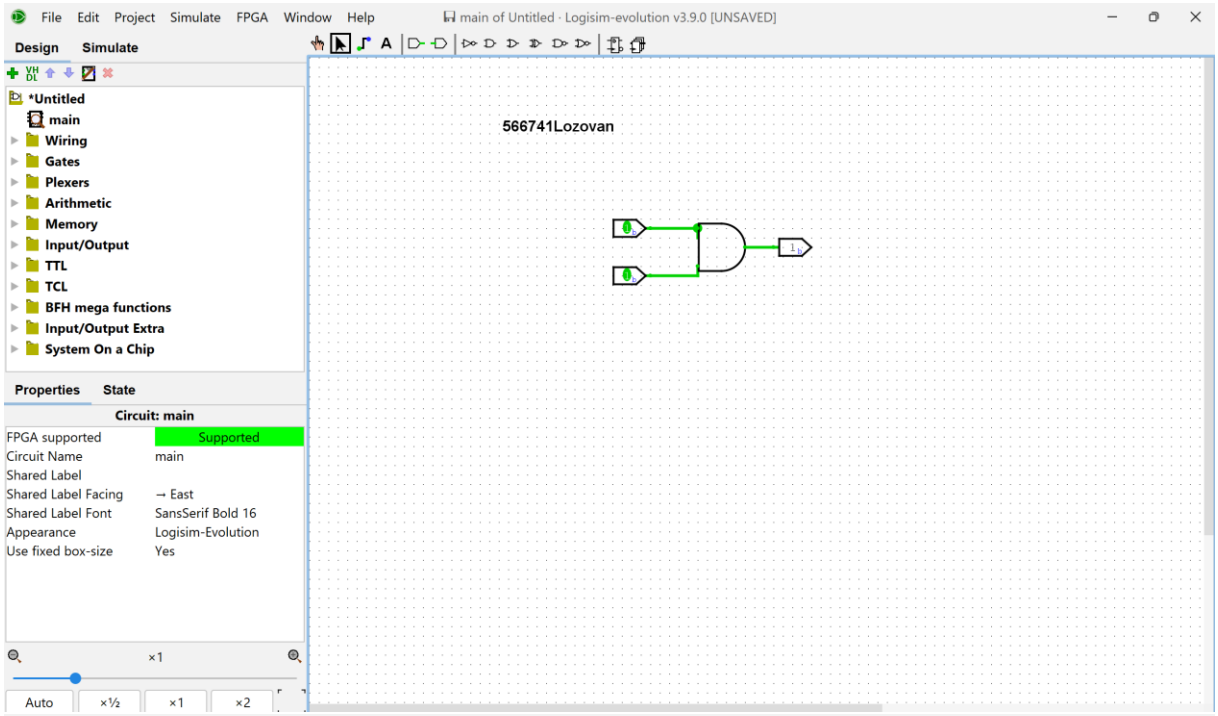
A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0

How can the design be simplified?

The design can be simplified by replacing the four NAND gates with a single NOR gate. This achieves the same logic output with fewer components, reducing complexity, power consumption, and response time.

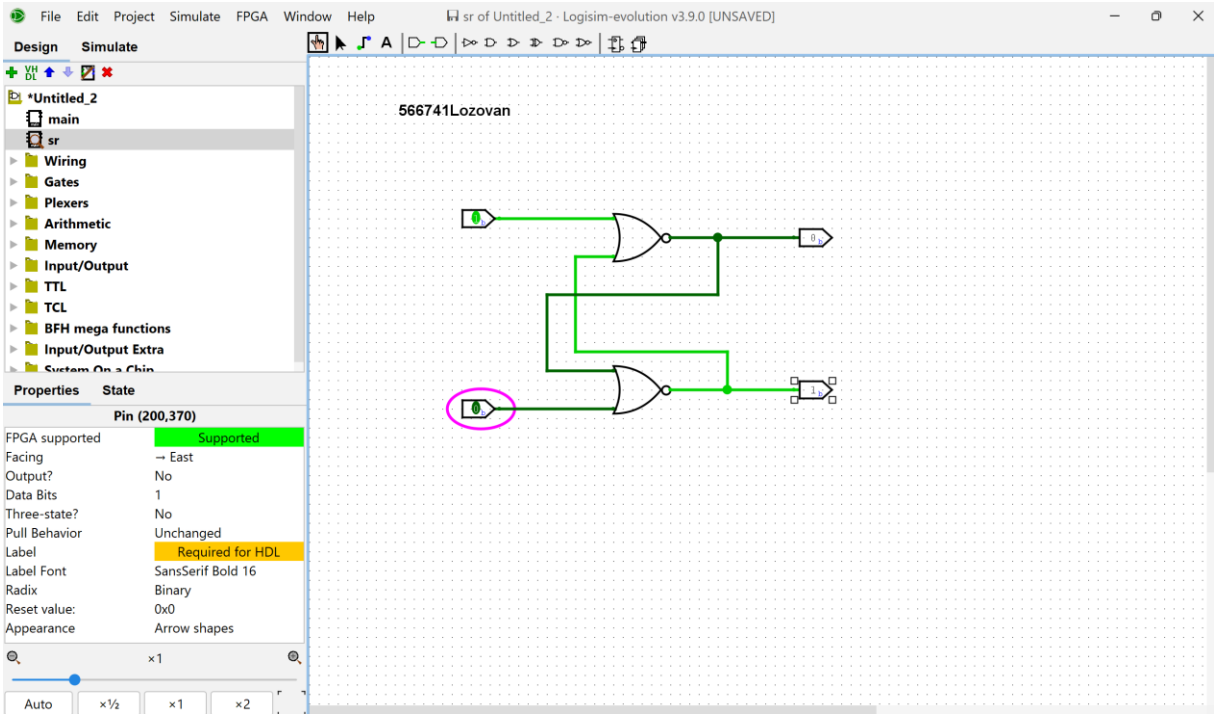
Assignment 2.4: Getting to know Logisim evolution

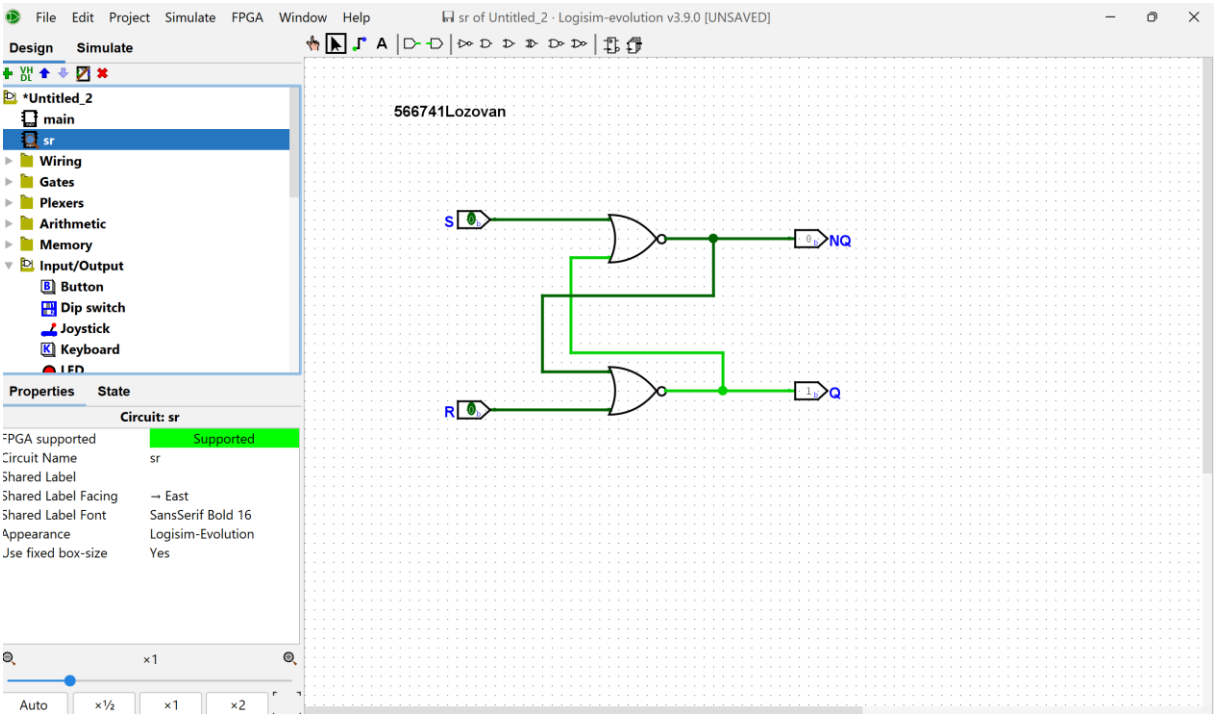
Screenshot of the design with your name and student number in it:



Assignment 2.5: SR Latch

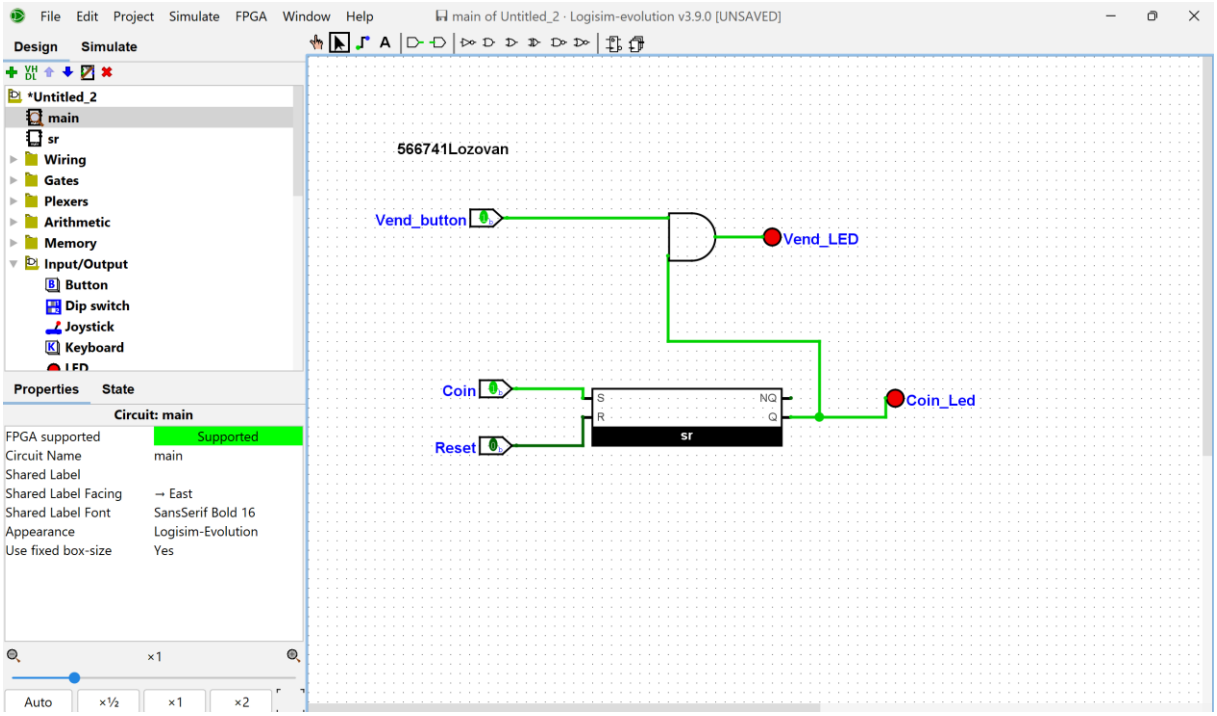
Screenshot SR Latch in Logisim with your name and student number:





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?

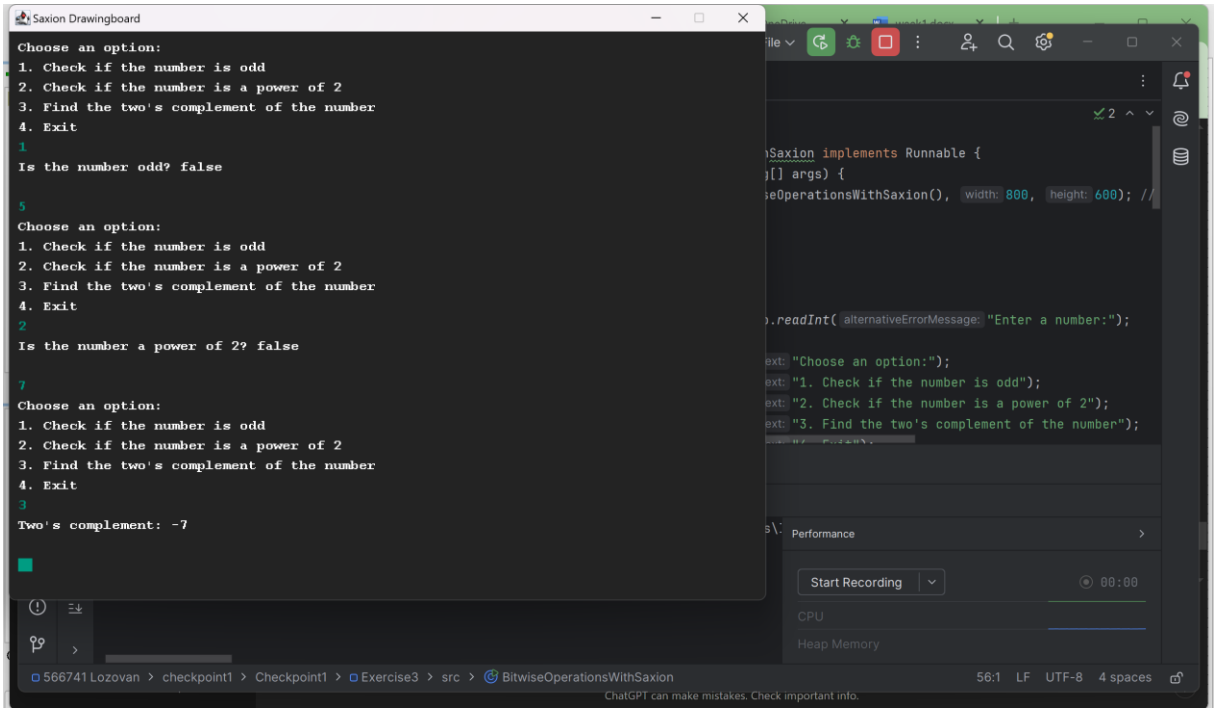
Implement the methods by using the bitwise operators you have just learned.

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.

```
import nl.saxion.app.SaxionApp;

public class BitwiseOperationsWithSaxion implements Runnable {
    public static void main(String[] args) {
        SaxionApp.start(new BitwiseOperationsWithSaxion(), 800, 600); // Start
SaxionApp with a specific window size
    }

    @Override
    public void run() {
        while (true) {
            int number = SaxionApp.readInt("Enter a number:");

            SaxionApp.printLine("Choose an option:");
            SaxionApp.printLine("1. Check if the number is odd");
            SaxionApp.printLine("2. Check if the number is a power of 2");
            SaxionApp.printLine("3. Find the two's complement of the number");
            SaxionApp.printLine("4. Exit");
            int choice = SaxionApp.readInt("Enter your choice:");

            switch (choice) {
```

```
                case 1:
                    SaxionApp.printLine("Is the number odd? " + isOdd(number));
                    break;
                case 2:
                    SaxionApp.printLine("Is the number a power of 2? " +
isPowerOfTwo(number));
                    break;
                case 3:
                    SaxionApp.printLine("Two's complement: " +
findTwosComplement(number));
                    break;
                case 4:
                    SaxionApp.printLine("Exiting...");
                    System.exit(0); // Exit the application
                    break;
                default:
                    SaxionApp.printLine("Invalid choice. Please try again.");
            }
            SaxionApp.printLine(); // Empty line for readability
        }
    }

    // Method to check if a number is odd
    public static boolean isOdd(int number) {
        return (number & 1) == 1;
    }

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

    // Method to find the two's complement of a number
    public static int findTwosComplement(int number) {
        return ~number + 1;
    }
}
```



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