Smart Parking System Report

The team:

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Objectives of these project:

1. Count as they enter and exit the parking.
2. Display the car count on a 7-Segment.
3. Indicate when the lot is full or empty using LEDs.
4. Control the parking gate using a DC motor.

Main Components of the circuits:

Circuit 1

IC 74LS190 (Counter)

It counts up\down based on the input

Key inputs:

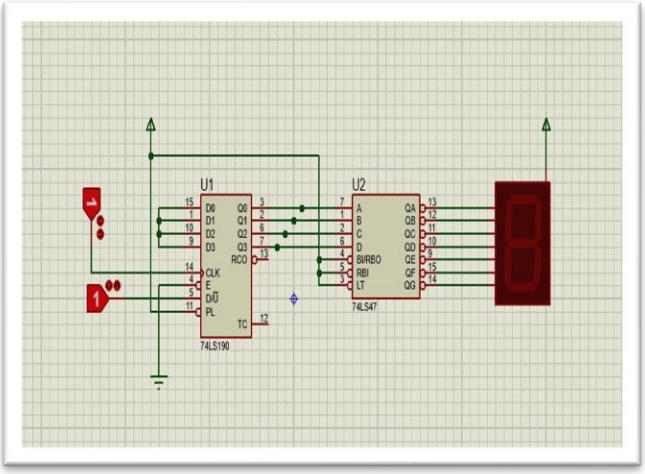
- **D0-D3**: data inputs used to load the initial value.
- **CLK (clock):** clock signal input that controls the counting.
- **E (enable):** activates or disables the counter.
- **D\U (direction up\down):** determines the counting direction:

Up = HIGH

DOWN= LOW

- **PL (preset load):** load the preset value to the counter. Outputs:
- **Q0-Q3 (binary signals):** representing the current count.

IC 74LS47 (Decoder)



It's a BCD (Binary-Coded Decimal) to the 7-Segment decoder. It converts the binary signals from the counter (Q0-Q3) into signals to control the segments. It supports Common Anode displays.

7-Segment Display

It used to show numbers (0-9) based on the signals of the decoder. It consists of 7 segments (a,b,c,d,e,f,g) that light up to form digits .

How this circuit work:

1. Connection between the Counter and the Decoder:
   The outputs Q0-Q3 (binary numbers) of the 74LS190 counter are connected to the
   Inputs A-D of 74LS47 decoder.
2. Connection between the Decoder and the 7-Segment Display:

   The outputs QA-QG from the 74LS47 are connected to the segments (a,b,c,d,e,f,g) and the signals determine which segment light up to form the desired number.

3. Buttons (Switches):

   • First button connected to the D\U to control the counting direction → HIGH (1): counts up → LOW (0): counts down

   • Second Button connected to PL to Load a preset value into the counter.

4. Clock signal:

   The Clock Signal (CLK) drives the counter. Each clock pulse increments (or decrements) the count depending on the direction set by the D/U input.

5. Displaying the number:

   The binary count generated by the 74LS190 is sent to the 74LS47 decoder which converts it into signals to control the 7- Segment Display then it shows the equivalent decimal of the binary count

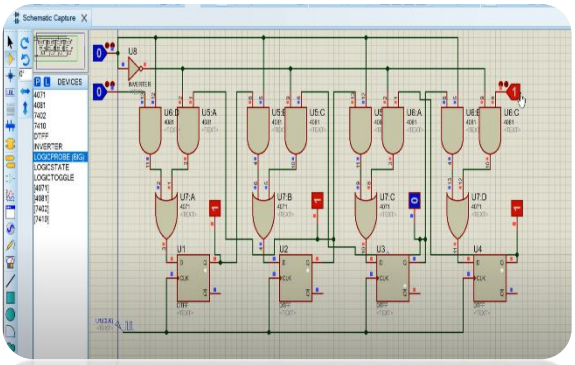
Circuit 2 (Known as the 4- bit bidirectional-shift-register)

Inputs Input Signals:

The circuit has input signals labeled "0" and "1".

Logic Gates:

• AND Gates:
Several AND gates (labeled U5: A, U5:C, U6: A, U6:C, U6:D) are used to perform logical AND operations.
• OR Gates: Several OR gates (labeled U7: A, U7: B, U7:C, U7:D) are used to perform logical OR operations.
• Inverter: An inverter (labeled U8) is used to invert the input signal.



Flip-Flops D-Type Flip-Flops:

There are four D-type flip-flops (labeled U1, U2, U3, U4) that store and propagate the state of the circuit. Each flip-flop has clock (CLK) inputs, D inputs, and Q and Q-bar outputs.
The outputs of the logic gates are connected to the inputs of the flip-flops and other gates, forming the logic needed for the circuit's operation. Feedback loops from the flip-flops' Q and Q-bar outputs to the logic gates are

essential for sequential operations. E) Indicators Logic State Indicators: Red and blue squares indicate the logic levels at different points in the circuit.

How this circuit work:

1. Input Processing:
   The inputs are fed into the logic gates, which process the signals according to their truth tables. The inverter (U8) inverts the input "0", which is then used in further logic operations.

2. Logic Operations:

• AND gates combine input signals to produce output signals when all inputs are true (logic 1).

• OR gates combine input signals to produce output signals when at least one input is true (logic 1).

3. Flip-Flop Storage:

The processed signals from the logic gates are fed into the D inputs of the flip-flops. When the clock (CLK) signal is triggered, the flip-flops store the value present at the D input. The stored values are then available at the Q outputs and their complements at the Q-bar outputs.

5. Feedback and Sequential Logic:
   If input "0" is active (logic 1), it is inverted by U8, and the resulting signal is used in the logic gates. The processed signals determine the state of the flip-flops, which then store and propagate the values based on the clock signal

The Final touch:

for the final touch we are going to add two infrared sensors one for the entry and one for the exit they will be connected to the inputs of the bidirectional-shift-register which is connected to the counter circuit.

The Entry sensor work when feel a car it triggers the counter to count up while, the exit sensor works by triggering the counter to decrease the count (count down).