

End Project Report on

Car Parking Mechanism

Course Code: EC256



Submitted for end project of IC Lab:

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ComponentsUsed:

RequiredfortheProject:

NAMEOFTHECOMPONENT	QUANTITY	PRICE
• Jk-FF 7476 IC	2	80/-
• Jk-FF 7473 IC	4	160/-
• IC 7483 (4 bit full adder)	1	40/-
• IC 7404 (not gate ic)	1	40/-
• IC 7448 (common cathode)	1	40/-
• IR SENSORS	2	120/-
• PCB	2	140/-

RequiredforthePowerSupplyCircuit:

NAMEOFTHECOMPONENT	QUANTITY	PRICE
• LM7805VoltageRegulator	1	10/-
• Transformer220v AC to 9-0 v	1	150/-
• IN4007Diode	4	4/-
• 1000uF,1ufCapacitor	1	15/-
• LED	1	2/-
• Resistor 1k ohm	1	2/-

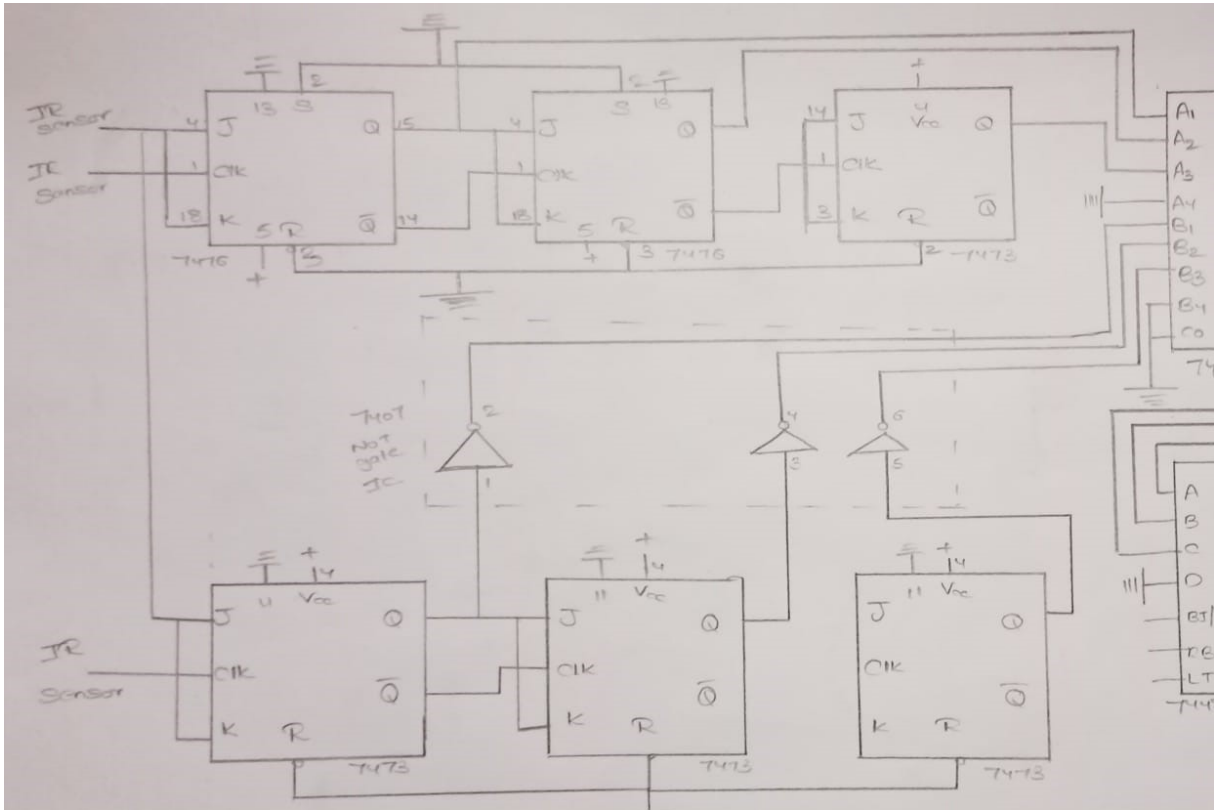
Introduction:

In these modern days finding car parking is a big issue in congested cities. There are too many vehicles on the road but not enough parking spaces. One of the biggest problems is when we enter a parking area then we realize that there are no empty parking slots to park our cars. Important time. Another biggest problem is after entering in a big parking area we confused to find the empty parking slot to park our car. Sometimes maybe we all have been facing these two problems that wasted our important time. That's why we need efficient parking management systems in all parking areas that will provide confusion-free and easy parking.

In this tutorial, we will design a “Smart Parking System Project” to overcome this problem. This project helps the car's driver to park their car with minimum wastage of time with accurate information of the availability of the space to park.

This smart parking system project consists of IC's, IR sensors, and one SSD display. Two IR sensors are used at the entry and exit gates to detect vehicle entry and exit in the parking area. The servo motor is placed at the entry and exit gate that is used to open and close the gates. Also, an SSD display is placed at the entrance, which is used to show the availability of parking slots in the parking area. When a vehicle arrives at the gate of the parking area, the display continuously shows the number of empty slots. If there have any empty slots then the system opens the entry gate by the servo motor. After entering the car into the parking area, when it will occupy a slot, then the display shows this slot is full. If there is no empty parking slot then the system displays all slots are full and does not open the gate.

CircuitDiagram:



Working of car parking mechanism:

The device is made up of PCB, IR sensors, IC7404, IC7483, IC7448, IC7476, Seven Segment Display. The IR sensor is used to detect the vehicle moment.

The sensor alerts the Master-Slave JK flipflops when there is a moment of vehicle across the sensors and generates a voltage of 3v which is treated as logic 1 to the Master-Slave JK flipflops.

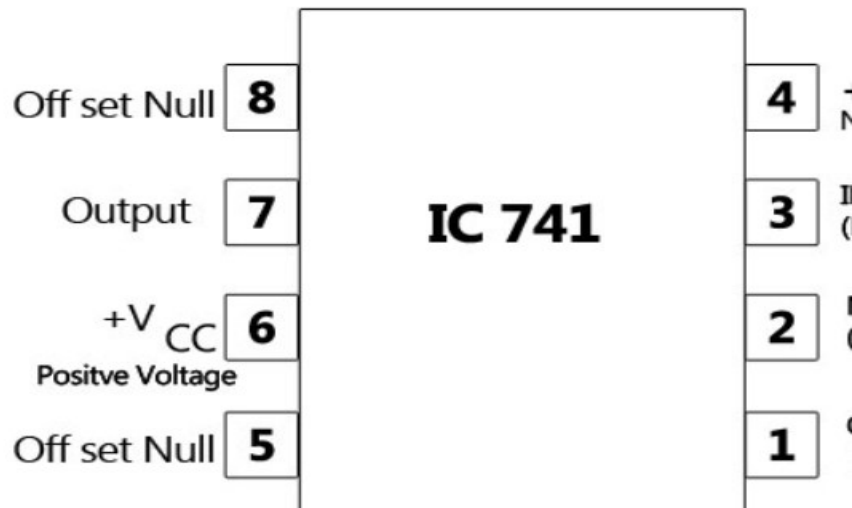
First set of 3 Master-Slave JK flipflopss generates the count of number of vehicles being entered in the binary format, and the second set of 3 Master-Slave JK flipflopss generates the count of number of vehicles being left in the 1's complement binary format.

These binary numbers are given as an input to the 7483 IC (4

bit full adder)to generates the final count of number of vehicles left in the parking space.

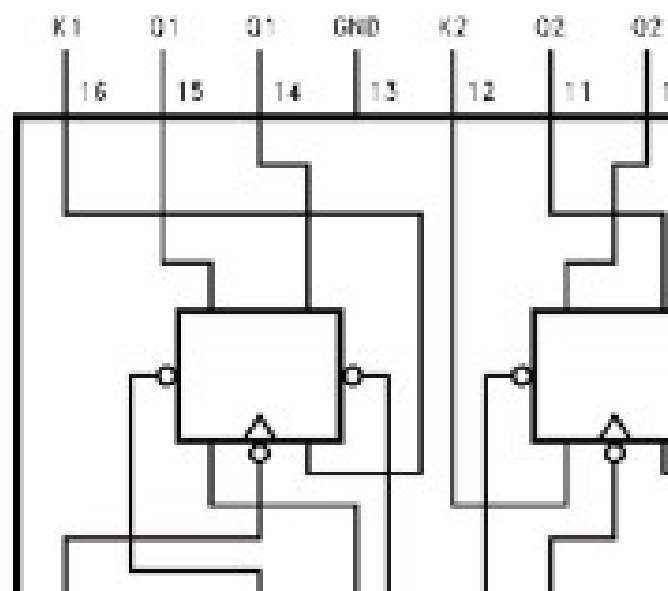
Common cathode IC is used to convert the binary signal (final count of number of vehicles) to the digital output which is represented on SSD.

Pin diagram of 741IC:

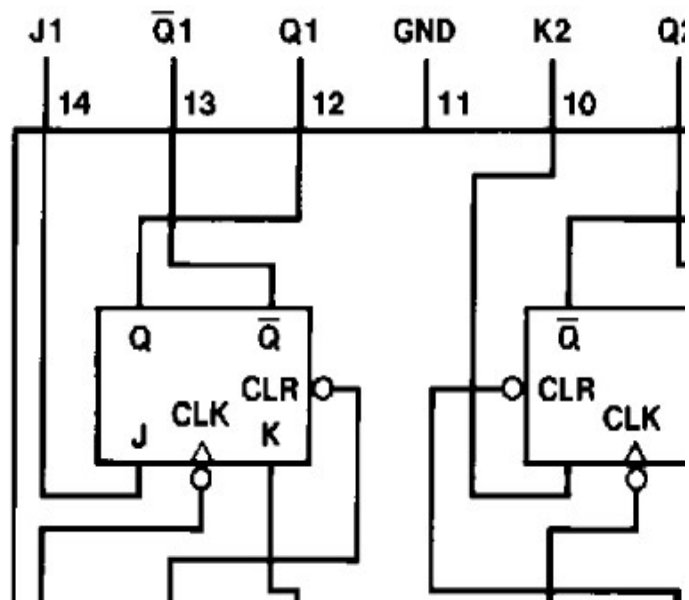


- Here 741 IC acts as non inverting analog comparator with reference value 0v
- Output from the IR sensor is given to the non inverting terminal of 741 IC.
- So opamp compares the vales at non inverting and inverting terminals and gives output as either +V_{sat} or -V_{sat}.
- Output of 741 IC is given to JK flip flop as clock and clock will trigger the count.

Pin diagram of 7476IC:

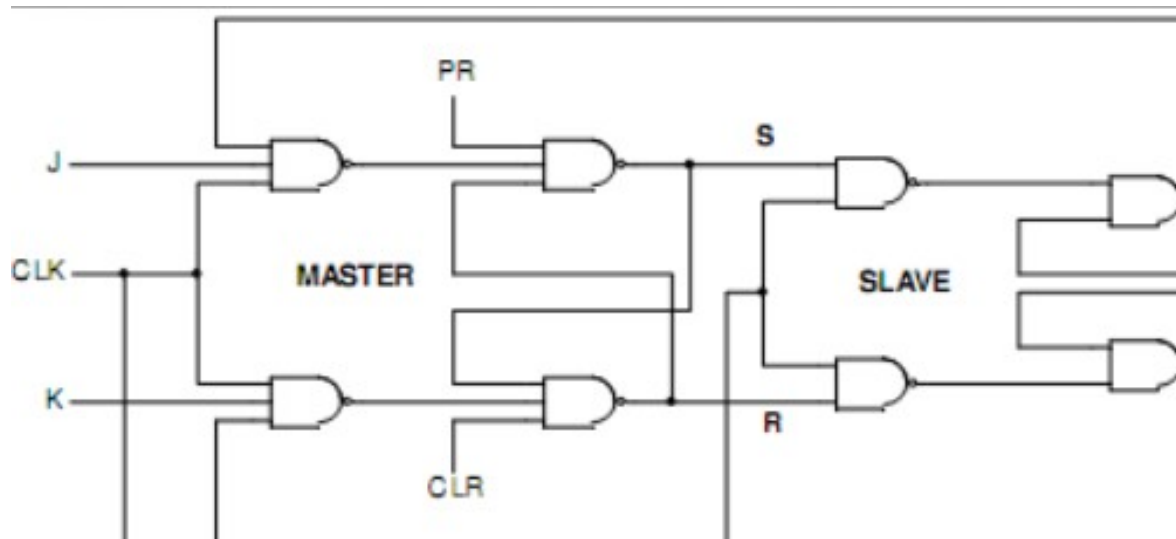


Pin diagram of 7473IC:



Working of Master-Slave JK flipflops:

Functionality of both IC 7476 and 7473 is same



Truth table of Master-Slave JK flipflops:

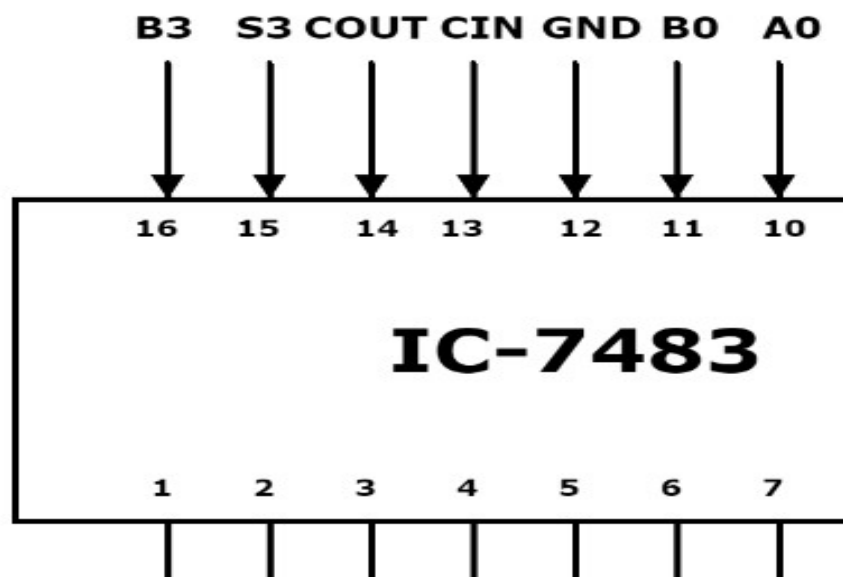
clock	j	K	Q	Qbar
High	0	0	0 _(prev state)	1
High	1	0	1 _(set)	0
High	0	1	1 _(memory)	0
High	1	1	0 _(toggle)	1

Here sequence of master slave flops acts like counter

- Whenever 1st vehicle enter the sequence of (A1,A2,A3,A4) is(1000)(LSB----MSB)
- Whenever 2nd vehicle enter the sequence of (A1,A2,A3,A4) is(0100)(LSB----MSB)
- Whenever 3rd vehicle enter the sequence of (A1,A2,A3,A4) is(1100)(LSB----MSB)
- Whenever 4th vehicle enter the sequence of (A1,A2,A3,A4) is(0010)(LSB----MSB)

- Whenever 5th vehicle enter the sequence of (A1,A2,A3,A4) is(1010)(LSB----MSB)
- Whenever 6th vehicle enter the sequence of (A1,A2,A3,A4)is(0110)(LSB----MSB)
- Whenever 7th vehicle enter the sequence of (A1,A2,A3,A4) is(1110)(LSB----MSB)

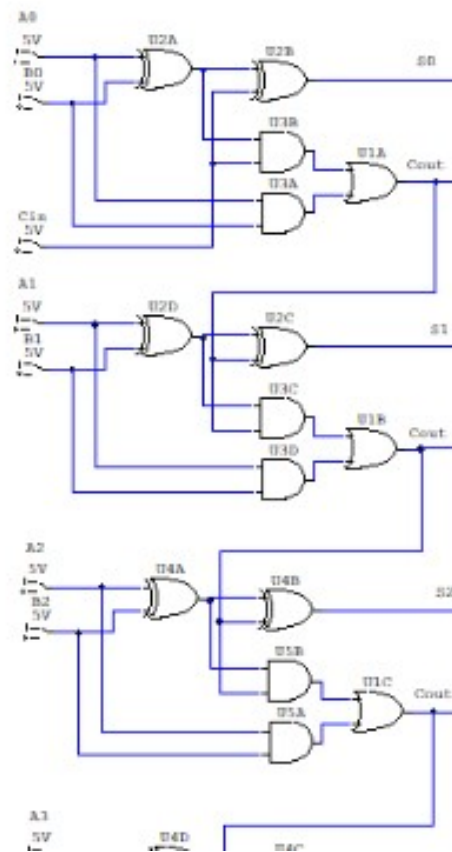
Pin diagram of 7483 IC:



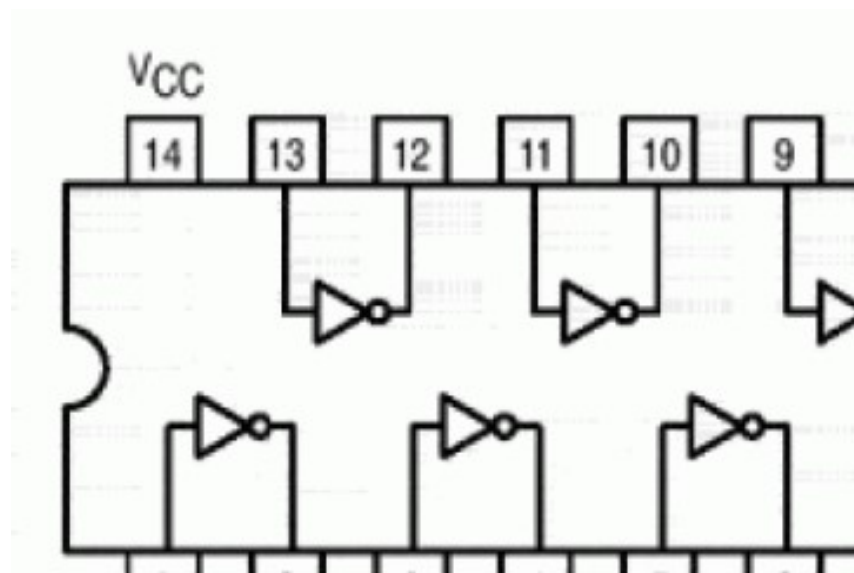
Working of 7483 4 bit full adder ic:

It is used to add the two binary numbers (A1,A2,A3,A4) and (B1,B2,B3,B4) to generate their respective sum which need to be converted from binary to digital.

Internal circuit diagram



Pindiagramof Ic7404 QuadNOTGate:

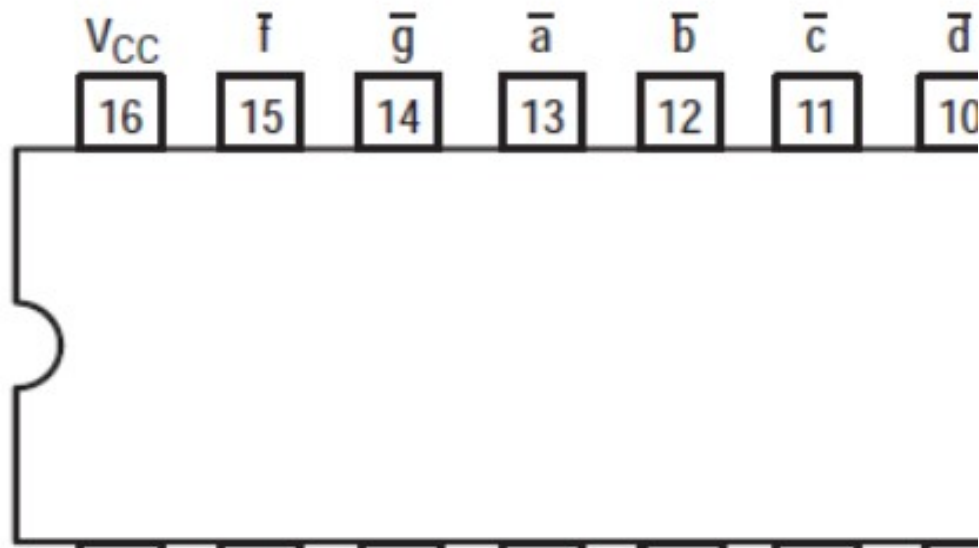


Working of IC7404 Quad NOT Gate:

Inputs of 7483 (B1,B2,B3,B4) are taken from the 7404 outputs (2,4,6) whose inputs are from second set of 3 Master-Slave JK flipflops which detects the number of vehicles left.

Number of vehicles	Jk ff o/p(Q1,Q2,Q3,Q4)	o/p sequence (B1,B2,B3,B4)
1	1000	0111
2	0100	1011
3	1100	0011
4	0010	1101
5	1010	0101
6	0110	1001
7	1110	0001

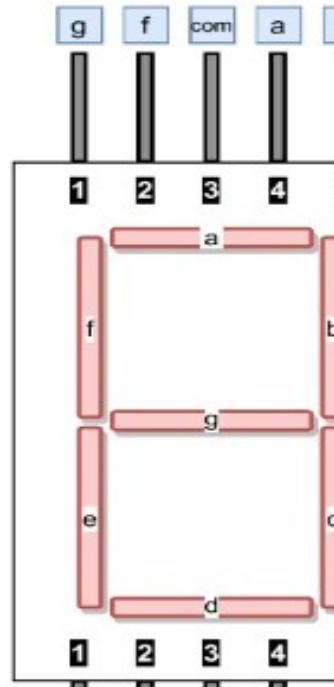
pin diagram of IC7448 common cathode :



Working of common cathode IC:

It is used to convert binary values as an input SSD to generate the digital value need to be represented on SSD

Seven segment display:

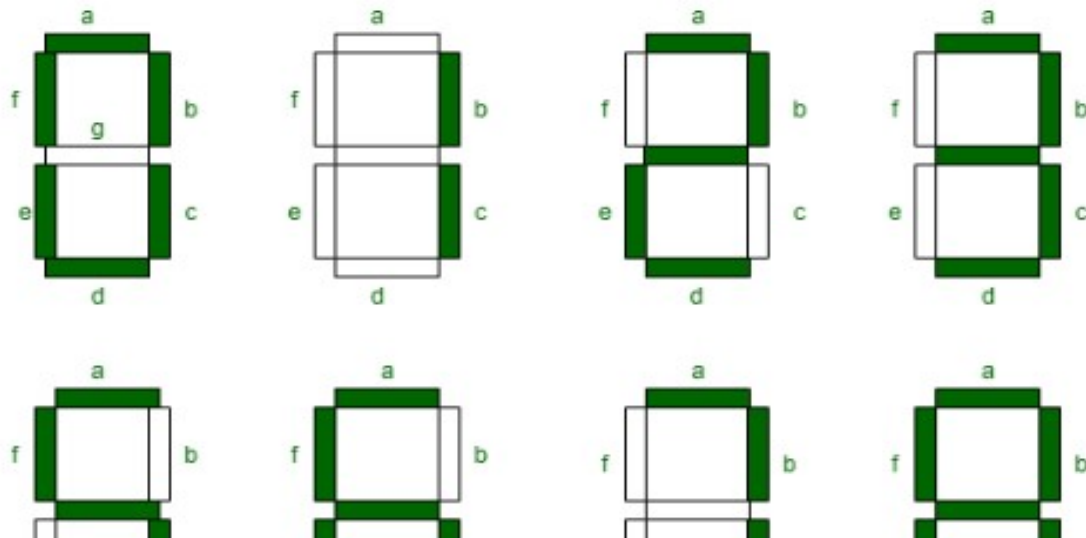


Working of SSD:

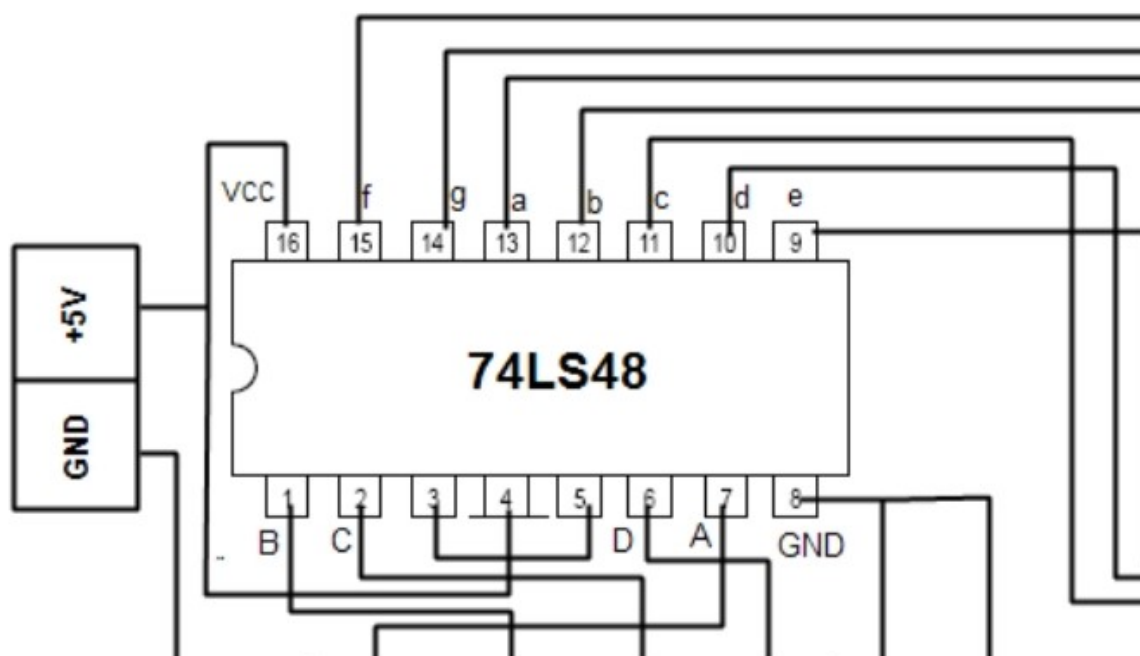
Decimal digit	a	b	c	d	e	f	g
0	1	1	1	1	1	1	0
1	0	1	1	0	0	0	0
2	1	1	0	1	1	0	1
3	1	1	1	1	0	0	1
4	0	1	1	0	0	1	1
5	1	0	1	1	0	1	1
6	1	0	1	1	1	1	1
7	1	1	1	0	0	0	0
8	1	1	1	1	1	1	1

9	1	1	1	1	0	1	1
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Digital representation on SSD:



Connection of 7448 to SSD:



IR sensor:



IR sensor is an electronic device, that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations.

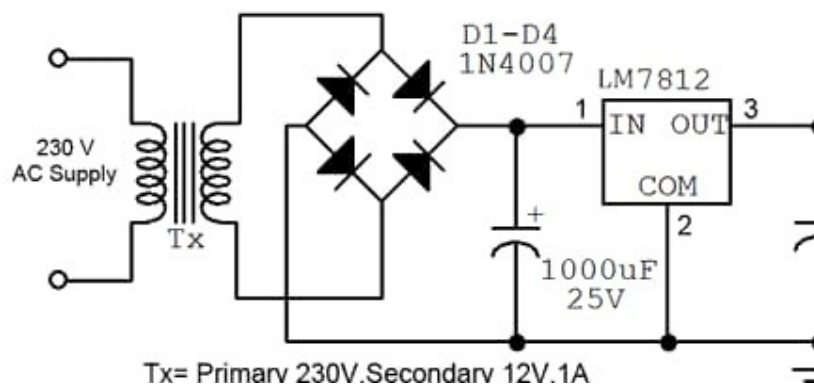
The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode. Photodiode is sensitive to IR light of the same wavelength which is emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received.

There are five basic elements used in a typical infrared

detection system: an infrared source, a transmission medium, optical component, infrared detectors or receivers and signal processing. Infrared lasers and Infrared LED's of specific wavelength used as infrared sources.

The three main types of media used for infrared transmission are vacuum, atmosphere and optical fibers. Optical components are used to focus the infrared radiation or to limit the spectral response.

Circuit Diagram of Power Supply Circuit:



Working of Power Supply Circuit:

The circuit you are referring to is a power supply circuit that uses a 12V transformer and 7805-voltage regulator IC to provide a stable 5V DC output. The circuit works by first stepping down the AC voltage from the transformer to a lower AC voltage, which is then rectified and filtered to produce a stable DC voltage. The voltage regulator IC then regulates this DC voltage to the desired output voltage.

The 12V transformer used in the circuit is a step-down transformer that reduces the input AC voltage to a lower voltage suitable for use in the circuit. The transformer has two primary windings and two secondary windings, each with a centre tap. The two primary windings are connected in parallel to the input AC voltage, while the two secondary windings are connected in series to produce a 9V AC output.

The 9V

AC output from the transformer is then fed into a bridge rectifier circuit, which consists of four diodes that are arranged in a bridge configuration. The rectifier circuit converts the AC voltage into a pulsating DC voltage, which contains both positive and negative voltage swings. The pulsating DC voltage is then filtered using a capacitor connected across the output of the rectifier circuit. The capacitor smooths out the voltage fluctuations and produces a more stable DC voltage.

The filtered DC voltage is then fed into the input of the 7805-voltage regulator IC. The 7805 IC is a three-terminal voltage regulator that regulates the input voltage to a stable 9V DC output. The IC contains a voltage reference, an error amplifier, and a power transistor, which work together to regulate the output voltage. The voltage reference sets the desired output voltage, while the error amplifier compares the actual output voltage to the reference voltage and adjusts the power transistor accordingly to maintain a constant output voltage.

In summary, the power supply circuit using a 12V transformer and a 7805-voltage regulator IC works by first stepping down the AC voltage from the transformer, rectifying and filtering the voltage to produce a stable DC voltage, and then regulating the DC voltage to the desired output voltage using the 7805 IC. The circuit provides a stable and reliable 9V DC output that can be used to power a variety of electronic devices.

Turns ratio: $V1/V2=230v/12v=19.16$

Explanation of the project:

There are a total of two gate sensors one at the entrance and the other at the exit. the entrance gate gets open whenever a car wants to enter and the closes and the exit gate opens when car wants to exit and then closes



- ✓ Whenever the garage is full based on the capacity further vehicles were not allowed to enter.



Whenever the car passes over the IR sensors these IR sensors gets activated and provides a voltage of about 3v which gives a logic of 1 to the JK inputs if the input signal low logic 0 is given to Master-Slave JK flipflops.

clock	j	k	output
high	1	0	Vehicle enters & Count increment
high	0	1	Vehicle leaves & count decrement

- Whenever the vehicle enters the counter gets incremented by 1
 - whenever the vehicle leaves the counter gets decremented by 1
- We use IC7483 as a 4 bit full adder as we need to represent the final count of number of vehicles present in the parking slot.
- Total number of cars being entered through the entrance is given as an binary input to the 4 bit full adder (A1,A2,A3,A4)

- Total number of cars being left through the exit is given as an binary input in 1's complement form to the 4 bit full adder (B1,B2,B3,B4).
- Finally from this 7483 we get the count of total number of vehicles left in the parking slots.
- Outputs of this 7483 (s1,s2,s3,s4) is given as an input to the common cathode IC 7448 to activate the pins on seven segment display. (mainly used for binary to digital conversion)

Applications of the Project:

There are already many free smart parking applications available online in web and mobile stores of Android or iOS. Previously, reservation of parking space was done by calling to the service provider and now with the current usage of internet and smart phones, these services are provided online using mobile and web applications. These applications serve as decision support systems for the driver in occupying a vacant parking space. For instance, if the application shows a particular parking lot of choice to be full, the driver can search for nearby parking lots with available parking spaces or choose another destination. In this way, smart parking applications serve as decision support systems in occupying available parking spaces.

- Smart parking tools improve efficiency based on the following three categories:
 - Guide the driver to parking lot using display boards.
- Reserve and authorize the driver to a parking lot.
- Reserve and guide the driver to a specific parking space using navigational information.
- Convenience for the car driver
- Easier supervision for the management
- Security of the parking area

- Accuracy of time tracking
- Ease of maintenance
- The three categories mentioned earlier are the ways in which efficiency of parking is improved using existing smart parking tools.
- The level of efficiency varies with each category. The first category would improve the parking efficiency, however cruising for the empty parking space would still be involved.
- The second category reserves a parking space for the driver, however, the driver would still search for the reserved parking space manually which also involves some amount of cruising while searching for the location of reserved parking space.
- The third category provides improved efficiency compared to the two previous categories as it facilitates in reserving and guiding the driver using the navigational information to the parking space.

Future Scope of the Project:

This kind of technology is mostly used in heavy crowded areas for parking like theaters, malls, airports, railways parking slots.

It can be more accessible to user if we create an app where ever the parking space is available along with the number of spaces available.

Conclusion:

Using this kind of car parking mechanism we can avoid time waste which gives accurate count of spaces occupied in the Parking slot

If there was no more space in certain parking slot then it

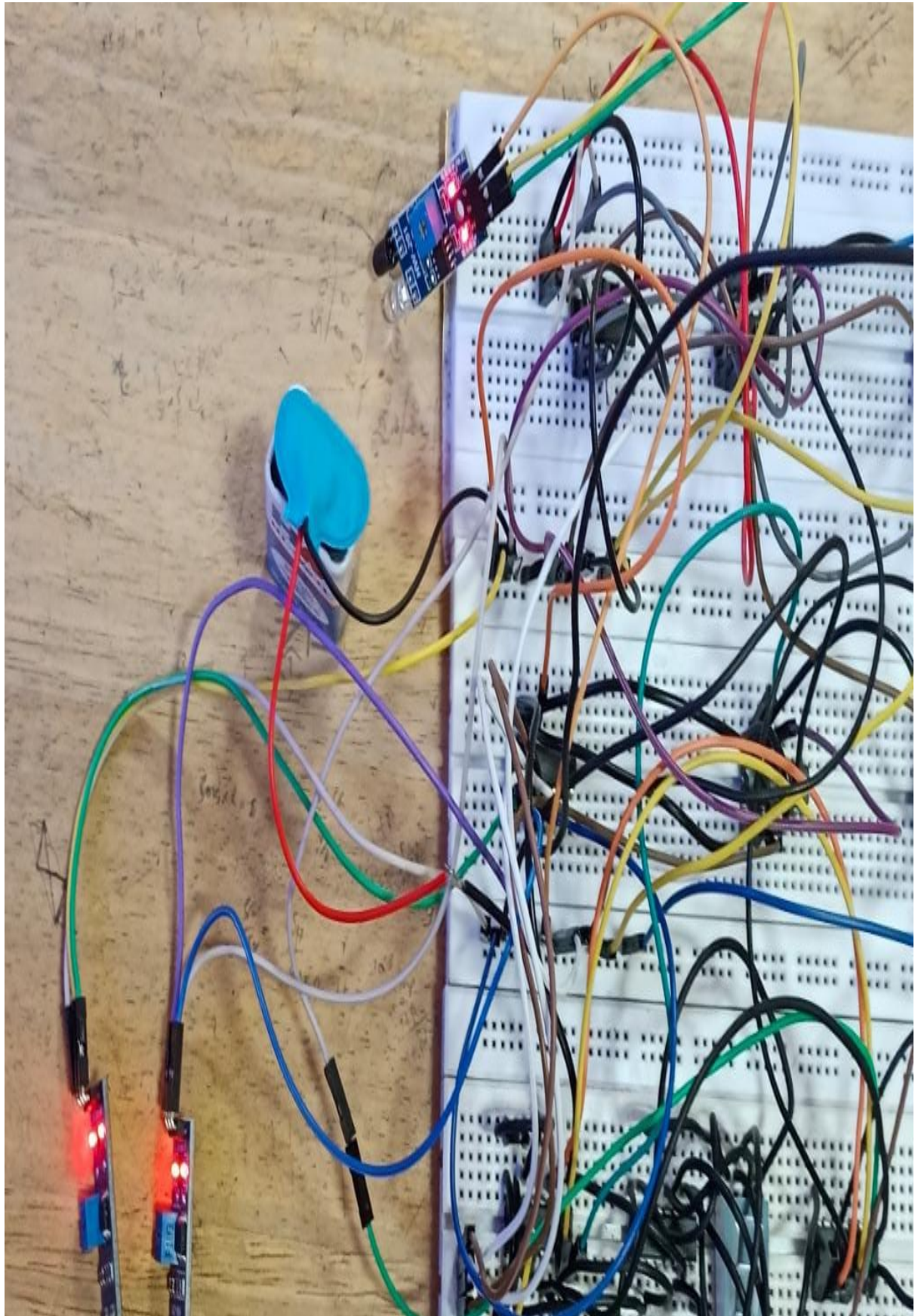
many save the time of user and they may search for new palce instead of waiting for the count given manually which is either accurate or not.

LimitationsandIssues Facedwhile doingProject:

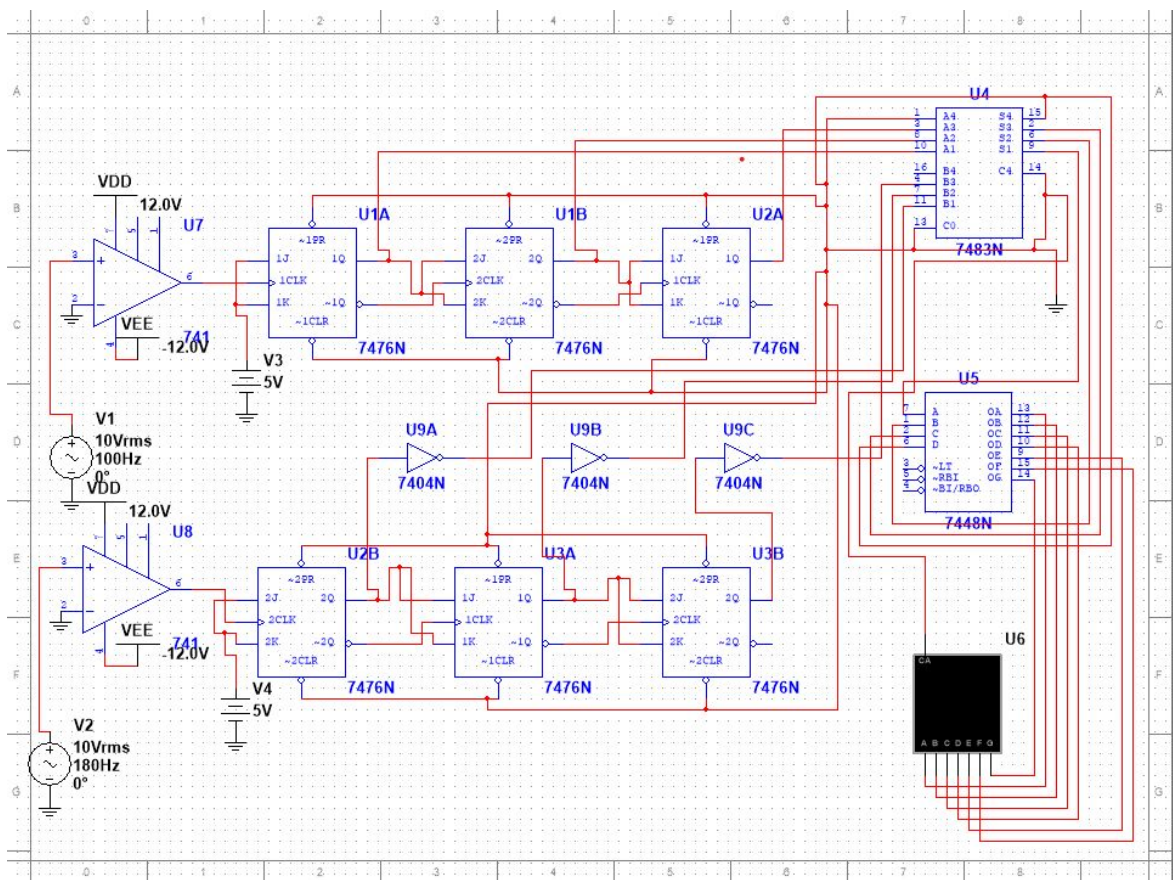
As we are using only one seven segment display it can show count from 0 to 9 for more than 9 it resets to 0 which leads to the requirement of more number of master slave flip flops and SSD to show the actual count.

References:

1. <http://www.next.gr/circuits/afx-slot-car-lap-counter-l36176.html>
2. <https://youtu.be/plpfLH5HAc4>
3. <https://www.electroduino.com/smart-parking-system-project-using-arduino-and-ir-sensor/>



Multisim simulation:



Prototype:

