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19ECE204 Digital Electronics and Systems

Assignment – 1

Roll No: CB.EN.U4CSE22106

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### Problem statement:

Develop a traffic light controller system that employs sequential logic to manage a four-way intersection with four distinct inputs, focusing on optimizing traffic flow and ensuring safety. The goal is to design a system that can efficiently control the sequencing of traffic lights, taking into consideration the input signals representing various directions of traffic. The objective is to minimize congestion, enhance intersection efficiency, and prioritize safety through the implementation of a robust sequential logic-based traffic light control mechanism.

### Design:

#### Truth Table.

Counter State				1st Signal			2nd Signal			3rd Signal			4th Signal		
A	B	C	D	G1	Y1	R1	G2	Y2	R2	G3	Y3	R3	G4	Y4	R4
0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	1
0	0	0	1	1	0	0	0	0	1	0	0	1	0	0	1
0	0	1	0	1	0	0	0	0	1	0	0	1	0	0	1
0	0	1	1	0	1	0	0	0	1	0	0	1	0	0	1
0	1	0	0	0	0	1	1	0	0	0	0	1	0	0	1
0	1	0	1	0	0	1	1	0	0	0	0	1	0	0	1
0	1	1	0	0	0	1	1	0	0	0	0	1	0	0	1
0	1	1	1	0	0	1	0	1	0	0	0	1	0	0	1
1	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1
1	0	0	1	0	0	1	0	0	1	1	0	0	0	0	1
1	0	1	0	0	0	1	0	0	1	1	0	0	0	0	1
1	0	1	1	0	0	1	0	0	1	0	1	0	0	0	1
1	1	0	0	0	0	1	0	0	1	0	0	1	1	0	0
1	1	0	1	0	0	1	0	0	1	0	0	1	1	0	0
1	1	1	0	0	0	1	0	0	1	0	0	1	1	0	0
1	1	1	1	0	0	1	0	0	1	0	0	1	0	1	0

## Minimization procedure

a) Jk-1 Flip Flop.

AB \ CD				
	00	01	11	10
00	0	0	0	0
01	0	0	1	0
11	0	0	1	0
10	0	0	0	0

Ta=BCD.

b) JK-2 Flip Flop

AB \ CD				
	00	01	11	10
00	0	0	1	0
01	0	0	1	0
11	0	0	1	0
10	0	0	1	0

Tb=CD

c) JK-3 Flip Flop

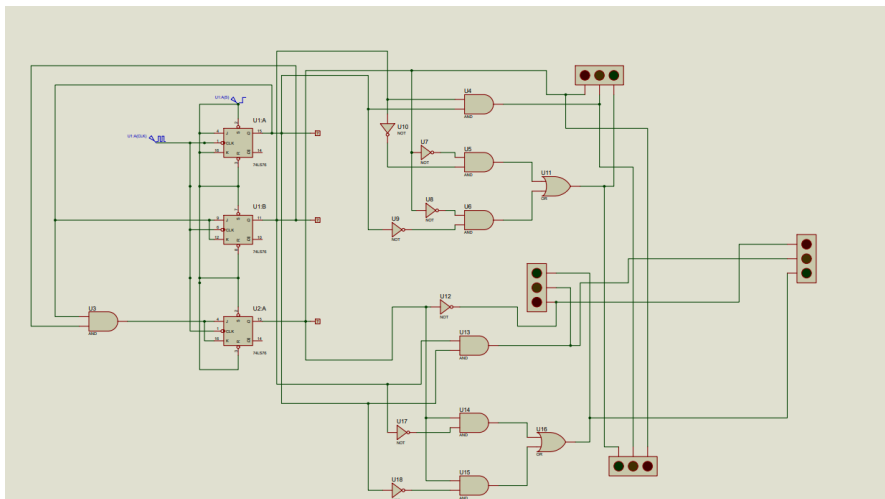
AB \ CD				
	00	01	11	10
00	0	1	1	0
01	0	1	1	0
11	0	1	1	0
10	0	1	1	0

Tc=D

LOGICAL EXPRESSION.

$$F = BCD + CD + D.$$

**LOGIC CIRCUIT.**



## Components required:

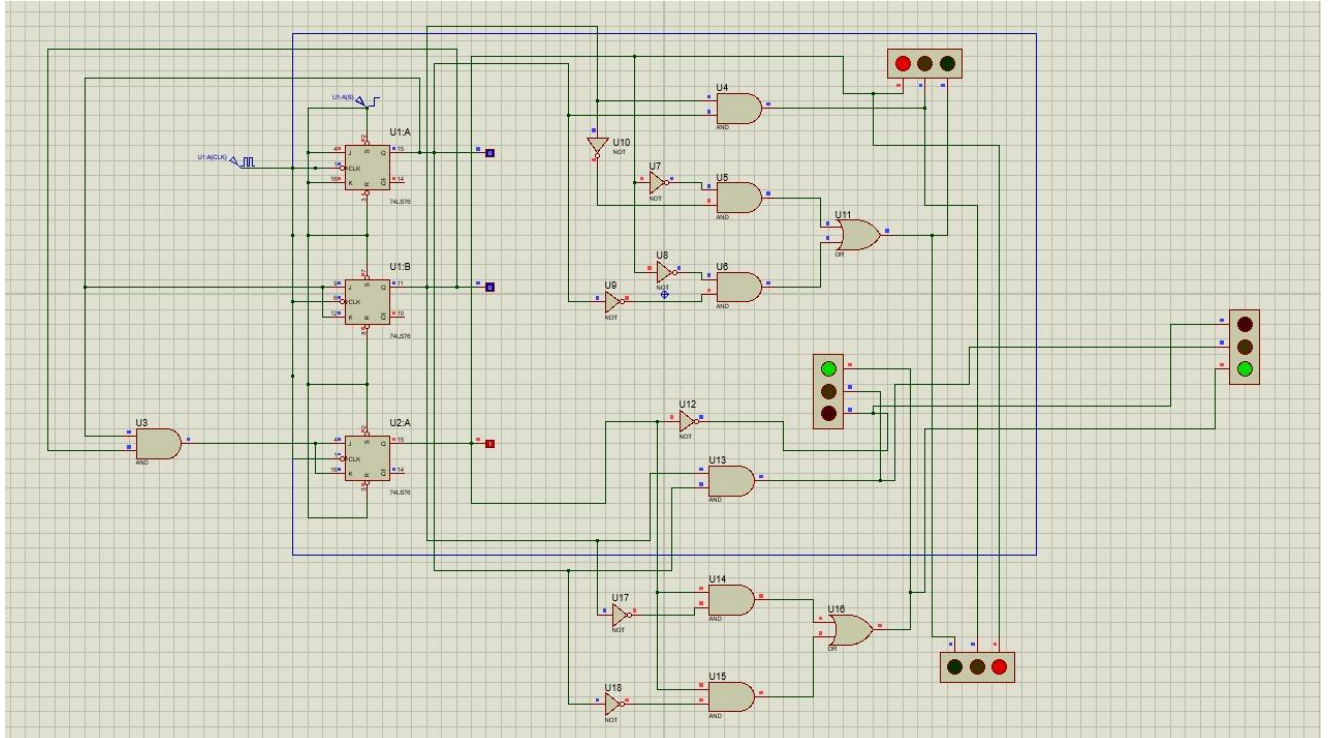
SL.NO	Components	Description	Quantity
1.	IC 74112	DUAL JK FLIP FLOPS	3
2.	IC 7408	2 INPUT AND GATE	7
3.	IC 7432	2 INPUT OR GATE	2
4.	IC 7404	NOT GATE	7
5.	TRAFFIC LIGHTS	-	4
6.	CONNECTING WIRES	-	AS REQUIRED

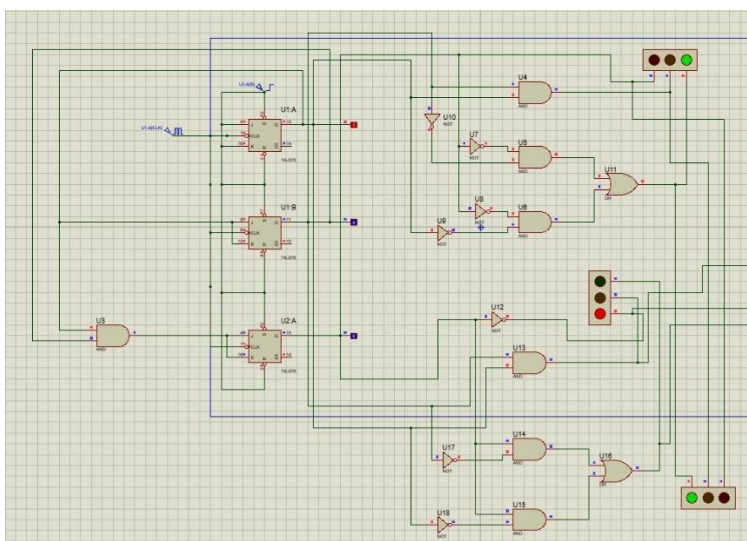
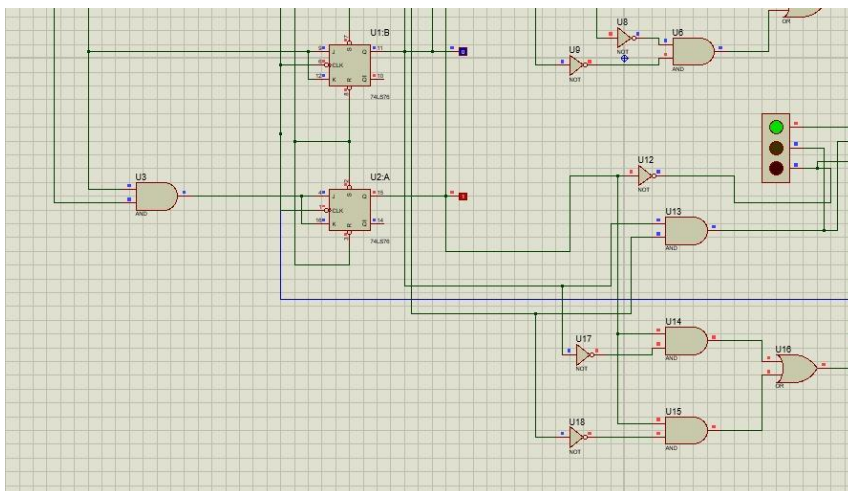
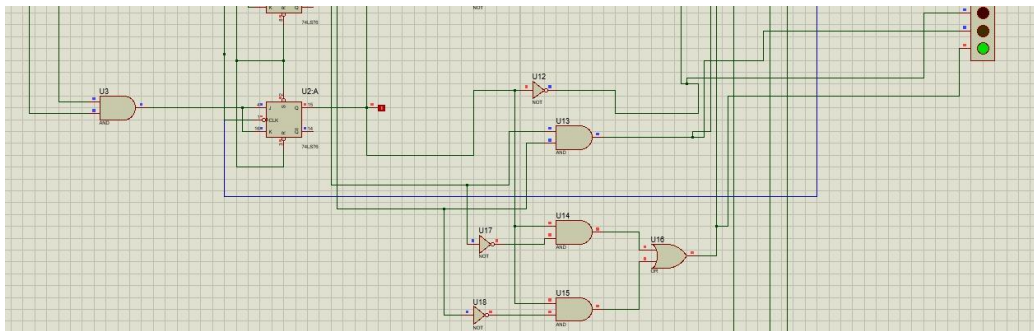
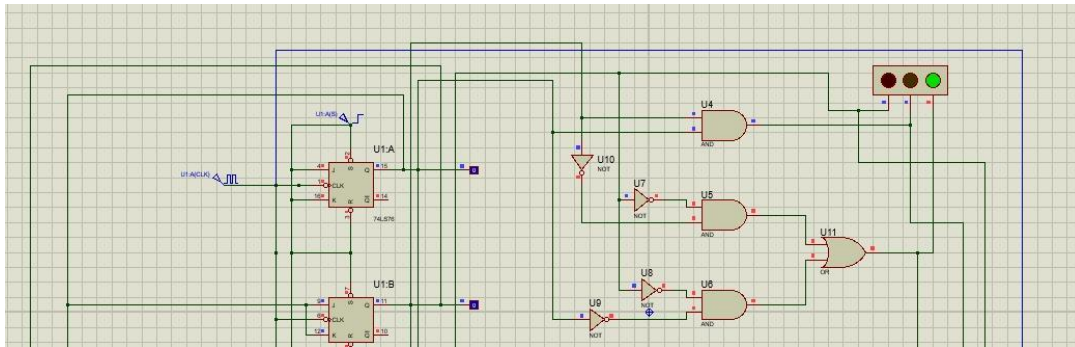
## MINIMAL COST:

SL.NO	ITEM	COST
1	COMPONENT	23
2	INPUT	40

TOTAL=63

## SIMULATION.





## **DESCRIPTION.**

The detector signal (D) indicates whether or not there are vehicles waiting at the intersection.

The counter signal (Counter) indicates the current state of the traffic light controller.

The traffic light controller uses the detector signal and the counter signal to determine which approach should have the green light.

The traffic light controller sets the green, yellow, and red signals for each approach accordingly.

The traffic light controller increments the counter signal.

The traffic light controller repeats steps 3-5 until all approaches have had the green light.

The traffic light controller can also be configured to operate in different modes, such as:

Vehicle actuated: The traffic light controller uses the detector signal to determine which approach should have the green light.

Timed: The traffic light controller changes state at regular intervals, regardless of the detector signal.

Pedestrian actuated: The traffic light controller uses a pedestrian button to determine when to give the green light to pedestrians.

## OUTCOME AND CONCLUSION.

In conclusion, the 4-way traffic signal using T flip-flops proves to be a solid solution for efficient intersection traffic control. This project demonstrates the real-world application of digital logic, underscoring the significance of dependable sequential circuits. The T flip-flop design ensures a seamless progression in the traffic light sequence, promoting safe and orderly vehicle movement. Beyond its practical use in traffic management, this project doubles as an educational resource for understanding digital electronics principles. As we anticipate future advancements, integrating technology will propel traffic systems to new heights, fostering heightened efficiency, safety, and sustainability in urban environments.