EXPERIMENT – 3

COMBINATIONAL CIRCUIT BASED CAR SECURITY SYSTEM

Aim: To Design a combinational circuit that check the following conditions to start the car engine. In case of condition fails, needs to blow the horn.

- Unlock the doors
- Whether the seat belt is fasten or not
- whether the doors are properly closed or not

Apparatus:

Logic Gates			
No of 3-input AND gates	No of 2-input AND gates	No of 2- input OR gates	No of Inverters
1	2	1	2

Pre-lab:

1. What is a combinational circuit-based car security system?

A: A combinational circuit-based car security system is an electronic system that utilizes combinational logic circuits to control and monitor security-related functions in a car. It typically involves the integration of various components such as sensors, switches, and logic gates to implement security features.

2. How does a combinational circuit-based car security system work?

A: The system works by processing input signals from sensors and switches using combinational logic circuits. For example, it may check whether the car doors are closed, if the seatbelt is fastened, or if certain conditions are met before allowing the engine to start. The combination of logic gates determines the system's response based on the input conditions.

3. What are some components commonly used in a combinational circuit-based car security system?

A: Common components include door sensors, seatbelt sensors, ignition switches, logic gates (AND, OR, NOT), and a buzzer or alarm system. These components work together to create a security system that responds to specific conditions.

4. Why is a combinational circuit-based approach suitable for a car security system?

A: Combinational circuits are well-suited for car security systems because they provide an instantaneous response based on the current input conditions. These circuits do not have memory or state, making them effective for evaluating specific situations and triggering appropriate actions without the need for sequential processing.

5. What happens if the conditions are not met in a combinational circuit-based car security system?
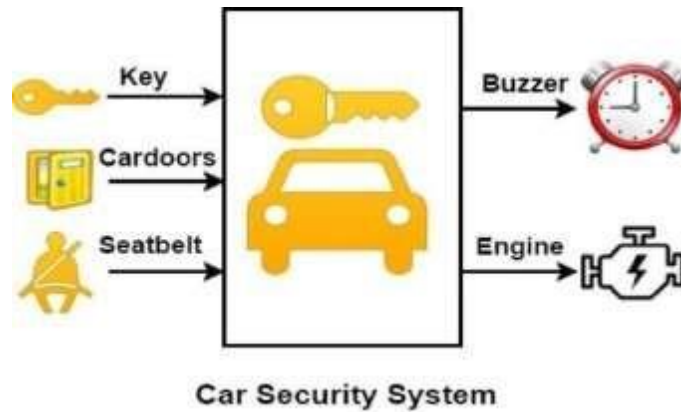
A: If the required conditions are not met, the combinational circuit-based car security system will prevent the engine from starting and may activate an alarm or buzzer to alert the user of the security issue.

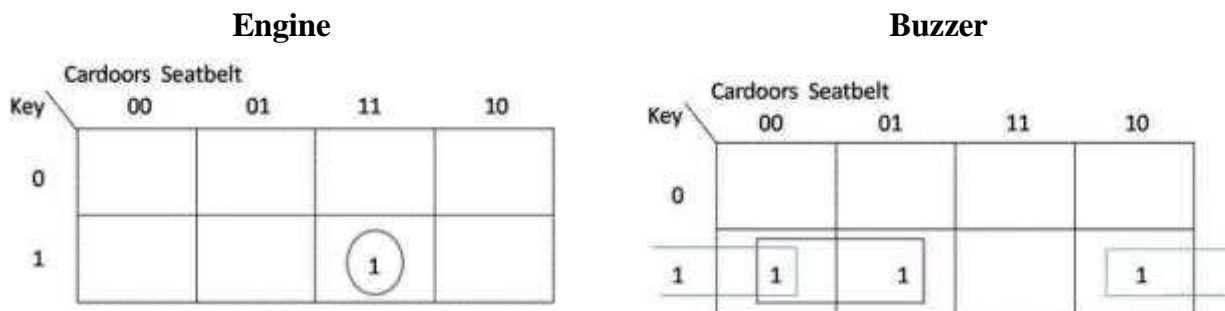**6. Can a combinational circuit-based car security system be customized for additional security features?**

A: Yes, the flexibility of combinational circuits allows for customization. Additional security features, such as motion sensors, GPS tracking, or remote locking mechanisms, can be integrated into the system by modifying the logic circuitry to accommodate new requirements.

Principle of Operation:

It is employed to ensure the security and safety of passengers during car travel. Upon a driver entering the car, it first verifies the proper closure of all doors. If the doors are securely closed, the system then checks whether the seatbelt is fastened. Only when all conditions are met will the engine start; otherwise, a buzzer will sound.
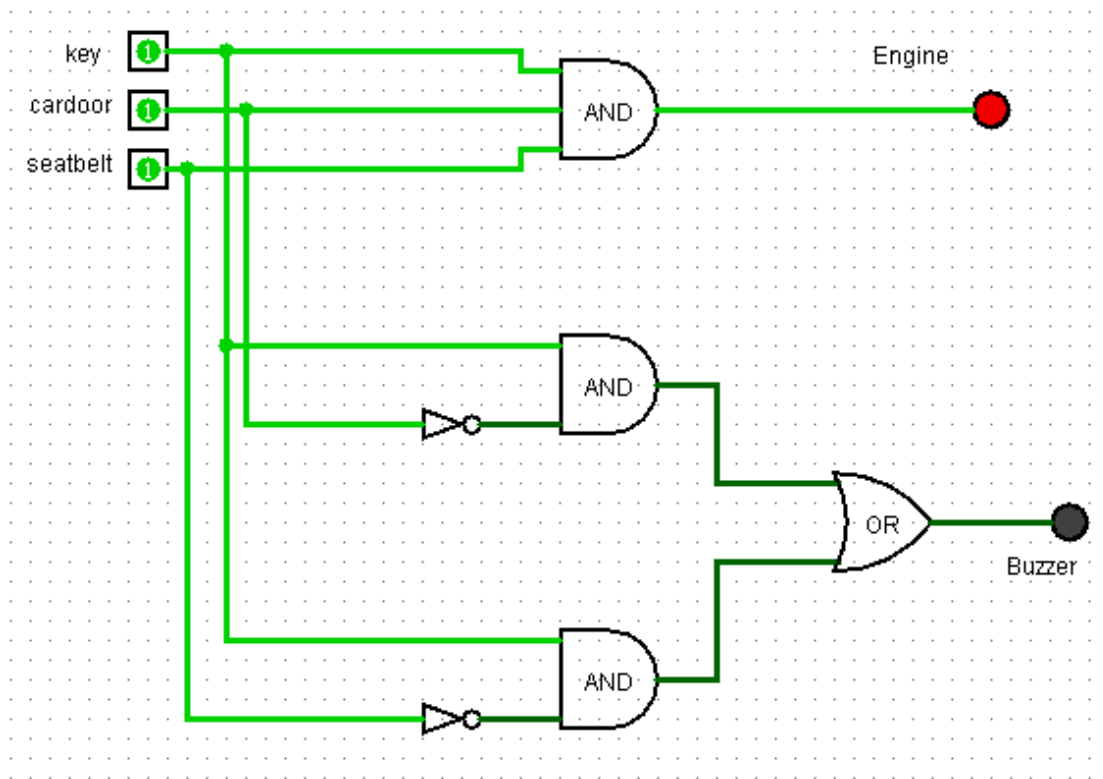
Block diagram:

Car Security System

Truth Table:

Inputs			Outputs	
Key	**Car doors**	**Seatbelt**	**Buzzer**	**Engine**
0	X	X	0	0
1	0	X	1	0
1	1	0	1	0
1	1	1	0	1

K-Maps:

Engine   **Buzzer**

Engine = Key. Cardoors . Seatbelt

Buzzer = Key . Cadoors ' + Key . Seatbelt '

Logic Diagram:

Procedure:

- Connect the circuit as per the logic diagram.
- Connect all the inputs of the circuit to the toggle switches.
- Connect all the outputs of the circuit to the LEDs.
- Apply the inputs as per the truth table.
- Observe and tabulate the output of the circuit.

Viva Questions and answers:

1. What is a combinational circuit-based car security system?

A: A combinational circuit-based car security system is an electronic system that uses combinational logic circuits to control and monitor security functions in a car, determining the system's response based on immediate input conditions.

2. How does the system determine if the car is secure to start?

A: The system checks conditions such as whether all doors are closed and if the seatbelt is fastened using combinational logic circuits. If these conditions are satisfied, the engine is allowed to start; otherwise, a buzzer is activated.

3. Which components are commonly used in a combinational circuit-based car security system?

A: Common components include door sensors, seatbelt sensors, ignition switches, logic gates (AND, OR, NOT), and an alarm or buzzer system.

4. Why is a combinational circuit-based approach suitable for a car security system?

A: Combinational circuits are suitable because they provide an immediate response to current input conditions, without the need for memory or sequential processing. This makes them effective for evaluating specific situations quickly.

5. What happens if the required conditions are not met in the security system?

A: If the required conditions are not met, the combinational circuit-based car security system prevents the engine from starting and may activate an alarm or buzzer to alert the user of a security issue.

6. Can additional security features be added to a combinational circuit-based car security system?

A: Yes, additional features like motion sensors, GPS tracking, or remote locking mechanisms can be added by modifying the logic circuitry to meet new security requirements.

 Result: Student is able to design a car security system using logic gates.