### **Tutorial-3**

### **Step 3 – Plan the Solution (Design the Algorithm)**

#### **3.1 Algorithm in Plain English**

1. Check if ignition is ON.
2. If ignition is OFF, the alarm stays OFF.
3. If ignition is ON, check the driver seat:
   * If the driver is present AND the belt is unfastened → alarm ON.
4. Check passenger seat:
   * If a passenger is present AND the belt is unfastened → alarm ON.
5. Otherwise, alarm OFF.

|  |  |
| --- | --- |
| **Symbol** | **Description** |
| **DRIV** | Driver present (1 = Yes, 0 = No) |
| **PASS** | Passenger present (1 = Yes, 0 = No) |
| **IGN** | Ignition ON (1 = Yes, 0 = No) |
| **BELT\_D̅** | Driver seatbelt unfastened (1 = Unfastened, 0 = Fastened) |
| **BELT\_P̅** | Passenger seatbelt unfastened (1 = Unfastened, 0 = Fastened) |
| **ALARM** | Alarm output (0 = Alarm ON, 1 = Alarm OFF) |

### **3.2 Truth Table**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DRIV** | **PASS** | **IGN** | **BELT\_D̅** | **BELT\_P̅** | **ALARM** |
| 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 |
| 1 | 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 | 1 |
| 1 | 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 0 |

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#### **3.3 Boolean Expression (SOP)**

For **ALARM\_ON** (active-HIGH version):

ALARM\\_ON = IGN \cdot DRIV \cdot BELT\\_D̅ + IGN \cdot PASS \cdot BELT\\_P̅

For **ALARM** (active-LOW output):

ALARM = \overline{IGN \cdot DRIV \cdot BELT\\_D̅ + IGN \cdot PASS \cdot BELT\\_P̅}

**3.4 Pseudocode**

IF IGN = 1 THEN

IF (DRIV = 1 AND BELT\_D̅ = 1) OR (PASS = 1 AND BELT\_P̅ = 1) THEN

ALARM = 0 // ON

ELSE

ALARM = 1 // OFF

ENDIF

ELSE

ALARM = 1 // OFF

ENDIF

#### 

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#### **3.5 Flowchart**

* Start
* Check IGN
  + If 0 → ALARM OFF → End
  + If 1 → Check driver & passenger seat conditions
  + If any seat occupied AND the belt is unfastened → ALARM ON
  + Else → ALARM OFF
* End

