### Date: 27/03/2025

# AUTHENTIC ASSESSMENT IN THE MODULE OF DIGITAL ELECTRONICS

#### **GRASPS Framework Breakdown**

#### Designing a Smart Traffic Light System for Kigali City/or RNP

### Scenario:

The Rwanda National Police (RNP) is facing increasing traffic congestion in Kigali City due to rapid urbanization and a growing number of vehicles. The current traffic light system is outdated and inefficient, leading to long wait times, accidents, and fuel wastage.

### 1. Goal

Design ,simulate and implement a digital logic-based traffic light control system that efficiently manages traffic flow at a four-way intersection in Kigali. Ensure the system reduces congestion, minimizes waiting time, and improves safety.

### 2. Role

Digital Electronics Engineering students with the role of:

Analyzing traffic patterns, designing a logic circuit for the traffic lights, Simulating and testing and implementing the prototype.

#### 3. Audience

Rwanda National Police (Traffic Division) – They will review and approve your design. Kigali City Council – They need assurance that the system will improve traffic flow. Local Drivers & Pedestrians – End-users who will benefit from reduced congestion.

#### 4. Situation

RNP is facing with the problem of inefficient traffic lights that operate on fixed timers leading to long wait times, accidents, and fuel wastage.RNP is proposing someone to come up with a smart logic-based prototype system that can:

- Sequence traffic lights correctly (Green  $\rightarrow$  Yellow  $\rightarrow$  Red).
- Adjust timing based on sensor inputs (optional for advanced learners).

• Handle emergency vehicle priority (bonus challenge).

# **5. Product/Performance**

- A circuit design (using logic gates, flip-flops, timers, or a microcontroller if applicable).
- A simulation (using software like Proteus, Logisim, or TinkerCAD).
- A presentation explaining the design choices and benefits and features.
- A physical prototype.

## 6. Standards & Criteria for Success

## **Functionality**

- Correct sequencing of traffic lights (Green  $\rightarrow$  Yellow  $\rightarrow$  Red).
- Smooth transition between different directions.
- Optional: Adaptive timing based on traffic sensors.

# Innovation

- Use of efficient logic design (e.g., counters, state machines).
- Bonus: Emergency vehicle detection system.

## Presentation

- Clear explanation of the circuit design.
- Justification of component choices.

Feasibility: Cost-effective and implementable in real-world conditions.

## End!