Exercise 4: Autonomous Traffic Control System

Scenario

You are tasked with developing the software for an **Autonomous Traffic Control System** at a large, busy intersection in a smart city. The system manages traffic lights, pedestrian crossings, and emergency vehicle priority. This system must efficiently handle real-time data, maintain synchronization, and coordinate multiple tasks to ensure smooth traffic flow, safety, and priority management. System description

- **Traffic Light Controller**
  - Manages traffic lights at the intersection.
  - Lights operate on a predefined timer but must adapt dynamically based on real-time data (e.g., traffic density or emergency vehicle presence).

- **Pedestrian Crossing Controller**
  - Handles pedestrian crossing requests using a button press simulator.
  - Pauses traffic flow to allow pedestrians to cross safely.

- **Emergency Vehicle Manager**
  - Detects approaching emergency vehicles and overrides normal traffic operation to clear the path.
  - Resets the system to normal operation once the emergency vehicle passes.

- **Central Monitoring System**
  - Logs events in real-time (e.g., light changes, pedestrian requests, and emergency vehicle detections).
  - Provides fault detection and handling (e.g., if a controller task fails).

- **Data Queue**
  - A central queue where data from sensors (e.g., traffic density and emergency vehicle presence) is posted and read by the relevant tasks.