EEX5362 -Performance Modelling

**Mini Project**

**Performance modelling and evaluation for the Colombo city bus network**

**Name: G.G.A Perera**

**Registration Number: 122513961**

**Student Number: s22010388**

1. **Identification of the complex system**

**Chosen system:**

Public transport system – Colombo bus system

The Colombo bus network is a large public transport system that links major cities, suburbs, and local routes across the western province of Sri Lanka. This system has multiple stakeholders. They are the National Transport Commission ( NTC), private and public bus operators, passengers, and traffic management authorities.

**Overview of the system**

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| Section | description |
| Buses | carry 40–60 passengers each and run on set routes. |
| Routes | Includes major roads like Colombo–Kaduwela, Colombo–Negombo, Colombo–Moratuwa, etc. |
| Bus stops | Interchange points are located at major hubs such as Pettah, Maharagama, and Nugegoda |
| Passengers | Daily commuters, students, and workers with different travel patterns |
| Traffic conditions | Morning and evening peak traffic affects the schedule performance |

**Problem of the system**

The current Colombo bus system has major performance issues, which are characterized by long passenger wait times, irregular travel schedules, and ineffective bus use. This results in passenger dissatisfaction, so it will result in increased reliance on private vehicles (which contribute to traffic) and reduce operational profitability.

In order to identify the root causes of these bottlenecks and analyze optimization techniques, it is important that this system be simulated.

1. **Performance Objectives**

We will focus on the following crucial performance objectives for the Colombo bus system.

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| **Objective** | **Description** | **Metric** |
| Minimize passenger waiting time | This is the most direct measure of service quality for the passengers. Our focus is to reduce the average time passengers spend waiting at the bus stop. | Average waiting time in minutes |
| Maximize system throughput (improve capacity) | This measures how many passengers the system serves per hour or day. It shows how well the system moves people. Higher throughput indicates better utilization and capacity. | Passengers/ hours |
| Maximize Bus Utilization | To avoid empty runs or crowding, make sure buses run close to ideal utilization levels. While high utilization is beneficial, overly high numbers suggest possible delays and overcrowding. | Total passenger journey time) / Total bus operating time |
| Improve reliability | Minimize the difference between the scheduled and actual travel times. Reliability is important because passengers can efficiently plan their trips when bus service is reliable. | On time performance % |
| Identify Performance Bottlenecks | Find the routes or times when poor scheduling or traffic lowers the quality of the service. | Route delay ratio, variance in travel time |
| Optimize Resource Allocation | Change the number of buses and frequency based on demand and traffic | Bus utilization rate, Bus utilization rate |