

CSC-105L Digital Logic Design

Project Proposal

Smart Traffic Signal System (Basic Model)



Submitted by:

Name: M.Kamran 2024-SE-24

Name: M.Ahsan Sadiq 2024-SE-40

Submitted to:

Miss. Rimsha Noreen

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Department of Computer Science

University of Engineering and Technology Lahore, New Campus.

SMART TRAFFIC SIGNAL SYSTEM (4017 TIMER-BASED DESIGN)

1. Description

INTRODUCTION

Traffic congestion and inefficient signal timing lead to unnecessary waiting and fuel consumption. This project proposes an automatic signal system using a 4017 Decade Counter and clock pulses to switch lights in a fixed sequence.

BACKGROUND STUDY

The system uses a 555 Timer or clock pulse generator to trigger a CD4017 IC, which sequentially turns ON/OFF traffic lights in a round-robin fashion—no sensors or programming involved.

NEED FOR THE SYSTEM

- To automate signal timing
 - Provide a low-cost hardware model
 - Eliminate manual switching of lights
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2. Objectives

- Simulate a working four-way traffic light using sequential logic.
 - Use Proteus for circuit simulation.
 - Build a simple and cost-effective hardware prototype without sensors or programming.
 - Understand how counters and timers can automate traffic systems.
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3. Tools and Technologies

3.1 SOFTWARE:

- **Proteus Design Suite** – Circuit simulation and visualization
- **MS Word** – For documentation

3.2 HARDWARE:

- **CD4017 Decade Counter** – Controls light sequence
 - **Clock Pulse Generator / 555 Timer** – Feeds clock pulses to the 4017
 - **LEDs** – To represent Red, Yellow, and Green lights
 - **Diodes** – Control signal direction and isolation
 - **Resistors, Capacitors, Breadboard, Jumper Wires**
 - **Power Supply**
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4. Project Tasks and Milestones:

4.1 UNDERSTANDING REQUIREMENTS:

- Studied traditional signal timing
- Decided on automatic fixed sequence using a 4017 IC

4.2 DESIGN PHASE:

- Designed circuit using 4017 outputs to control 4 traffic lights
- No sensors were used
- Sequence set via clock pulses

4.3 IMPLEMENTATION:

- Simulated circuit in Proteus
- Connected LEDs to 4017 outputs
- Designed PCB/breadboard layout

4.4 TESTING AND VALIDATION:

- Verified each light turns ON in proper sequence
- Adjusted timing of clock pulses for realistic switching
- Validated continuous loop behavior

4.5 DOCUMENTATION:

- Captured Proteus circuit screenshots
- Labeled components and connections
- Included design logic and observations in report

5. Conclusion:

SUMMARY OF PROPOSAL:

This project uses a 4017 counter and basic components to create a fully automated traffic light system based on a fixed timing cycle.

IMPORTANCE:

- Simple to build and understand
- Can be extended with sensors in future versions
- Demonstrates real-world application of digital logic

KEY ACHIEVEMENTS:

- Successfully simulated full sequence in Proteus
- Created a clean circuit diagram and working model
- No software or coding needed

CHALLENGES:

- Wiring complexity with multiple LEDs
- Timing adjustments for realistic switching
- Managing multiple outputs of 4017 without overlap

LESSONS LEARNED:

- CD4017 can manage multiple timed outputs efficiently
- Visual simulation in Proteus helps catch wiring errors early
- Even simple ICs can perform complex control tasks when designed properly

5. Circuit Diagram:

