ADDIS ABABA SCIENCE AND TECHNOLOGY UNIVERSITY

UNIVERSITY FOR INDUSTRY

COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

(COMPUTER STREAM)

Embedded Systems (ECEg 5403)

Project – 1

- **Embedded System Design**: LED Control with SPST Switch Using PIC24F04KA200

Prepared by:

KALEAB TESFAYE

Embedded System Design: LED Control with SPST Switch Using PIC24F04KA200

- This project uses a PIC24F04KA200 microcontroller to control three LEDs (Red, Green, and White) with a SPST switch. When the switch is on, the Red LED stays on, and the Green LED blinks every 2 seconds. When the switch is off, only the White LED lights up. The microcontroller handles the timing and controls the LEDs based on the switch's position.

Description of Components Used

- **PIC24F04KA200 Microcontroller**: This microcontroller is the heart of the project, handling all control and timing operations.

Some Key Features from the datasheet

- ✓ 16-bit architecture with an efficient RISC CPU for fast processing.
- ✓ Operates with an internal oscillator up to 8 MHz, eliminating the need for an external crystal in this project.
- ✓ Low power consumption, making it suitable for battery-powered or low-energy applications.
- ✓ Includes multiple I/O pins to interface with LEDs and a switch.
- ✓ Timer modules (like Timer1) allow precise time-based operations, such as toggling the Green LED every 2 seconds.

- **SPST (Single Pole Single Throw) Switch**: Acts as a user input device to toggle between two operational states (ON and OFF).

Some Key Features

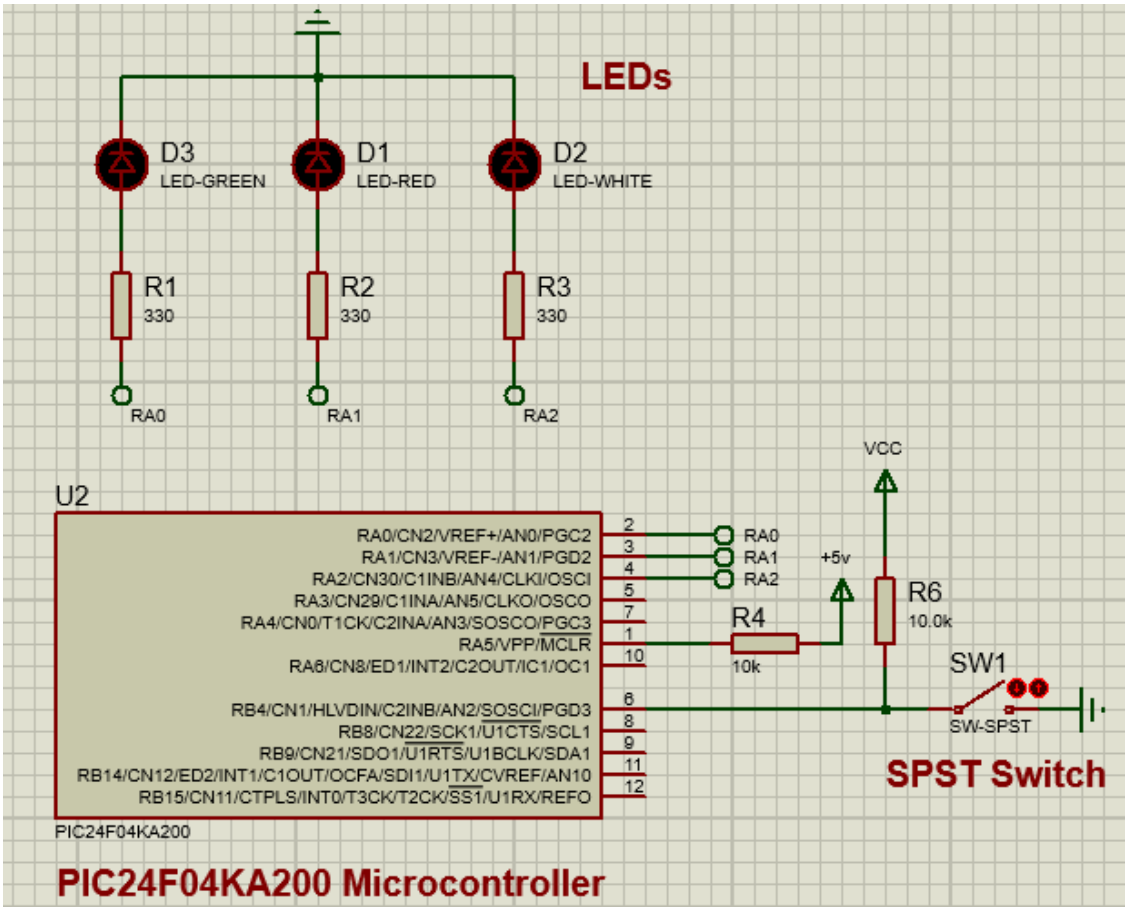
- ✓ Simple design with two terminals for easy interfacing.
- ✓ Provides a straightforward mechanism to change the circuit's behavior without requiring additional components or coding complexity.
- ✓ Reliable switching mechanism suitable for low-voltage DC circuits like this project.

- **220 Ohm Resistors (x3)**: Protect the LEDs by limiting the current flowing through them, ensuring they operate within safe limits.
  - ✓ Resistors are selected based on the LEDs' forward voltage (approximately 2V) and current (typically 20mA).
  - ✓ Provide precise resistance, ensuring consistent brightness across all LEDs.
  - ✓ High tolerance for temperature changes, ensuring stability in operation.

❖ **LEDs (Red, Green, and White)**: Serve as visual indicators for the system's state.

- ✓ Brightness and visibility are optimized for user feedback in different colors.
- ✓ Operate with a forward voltage of around 2.2V, matching the resistors' specifications for safe operation.
- ✓ Long-lasting and energy-efficient components.

Circuit diagram using Proteus software



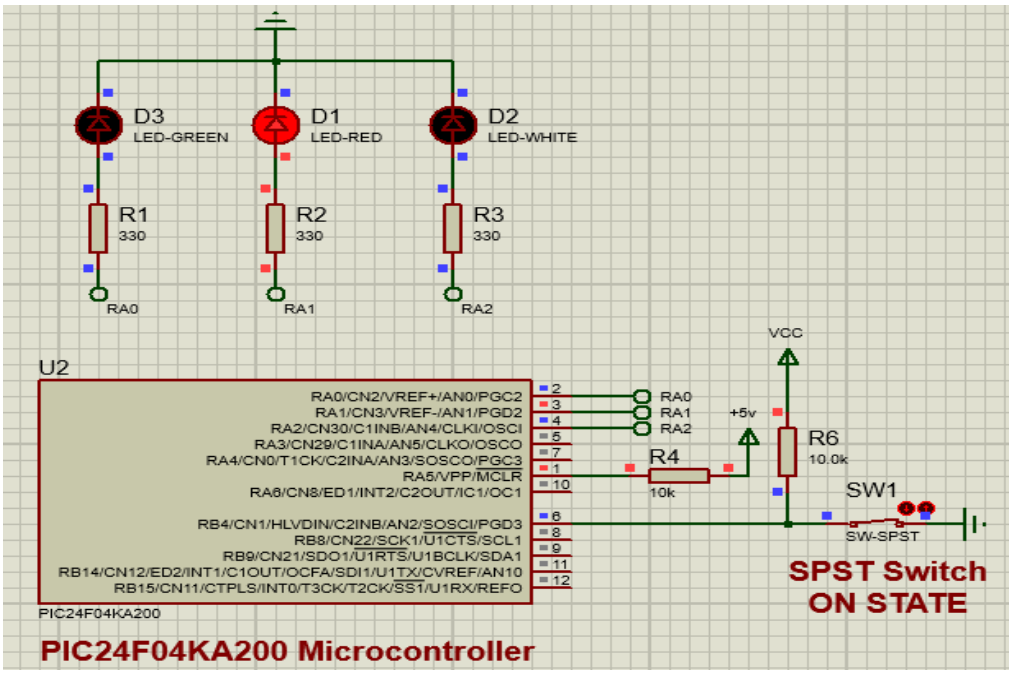
Code for the PIC24F04KA200 using MPLAB X IDE for pic compiler

```
/*
 * File:   main.c
 * Project Name: PIC24F04KA200_SPST_LEDs
 */
```

✹ Located in the repository folder on GitHub

Simulation result

- **When the SPST switch is on, the red led lights on and the green led is observed during simulation.**



- **When the SPST switch is off, the white led lights on leaving the other leds turned off.**