Laboratory 4: Blinking LED on the Control TM4C123GH6PMI Launch Pad

Experiment Sheet

Purpose
The purpose of this laboratory is to learn how to control LEDs using ARM assembly language programming. This will involve configuring GPIO (General Purpose Input/Output) pins and writing a program that turns an LED on and off in a loop.

Essential Knowledge

1. **GPIO Overview**
   General Purpose Input/Output (GPIO) pins are used in microcontrollers to interface with external hardware devices. Each GPIO pin can be configured as either an input or output. In this experiment, we will configure the GPIO pins to control an LED.
2. **Configuring GPIO Pins**
   To control an LED, the GPIO pin connected to the LED must be set to output mode. This involves writing to specific registers that configure the pin settings in the microcontroller.

   Registers to be Configured:

   - **Run Mode Clock Gating Control Register (RCGCGPIO)**: Located at **0x400FE608**. This register enables the clock for the GPIO ports.
   - **GPIO Port F Direction Register (GPIODIR)**: Located at **0x40025400**. This register sets the direction of the GPIO pins (input or output).
   - **GPIO Port F Digital Enable Register (GPIODEN)**: Located at **0x4002551C**. This register enables the digital function of the GPIO pins.
   - **GPIO Port F Data Register (GPIODATA)**: Located at **0x400253FC**. This register is used to write data to the GPIO pins, controlling the output states of the LEDs.
3. **LED Control**
   To turn an LED on, a high voltage (usually logical '1') is applied to the GPIO pin. To turn it off, a low voltage (logical '0') is applied. In ARM assembly, this involves writing to the GPIO data register.
4. **Delay Implementation**
   To create a visible blink effect, a delay routine will be implemented. This can be done using a simple loop to create a time delay.

GPIO Pin Assignments
On the TM4C123GH6PMI microcontroller, the following GPIO pins are commonly used to connect LEDs:

- **LED1**: Connected to **PF1** (Red LED)
- **LED2**: Connected to **PF2** (Green LED)
- **LED3**: Connected to **PF3** (Blue LED)

Task for Students

Modify the provided assembly code that currently only blinks a red LED. Your task is to change it into a traffic light control code that alternates between red, yellow, and green LEDs.