EXPERIMENT 4

ELEVATOR CONTROLLER

OBJECTIVE

- Create an elevator controller using the KL25Z board using the given specifications

SPECIFICATIONS

- The elevator is designed to move up and down 6 floors.
- To navigate to a floor, six push-button switches are to be used. Each floor has an LED light to indicate the floor. When a request is received through the push button, the corresponding LED should light up. The LED turns off after the desired floor is reached.
- The elevator's current position, including its movement, is to be shown on a seven-segment display. The seven segment display should blink while in motion and be constant when the floor is reached.
- When the elevator reaches the desired floor, it should wait for 5 seconds before moving to the next floor.
- The elevator should keep registering button presses for different floors even when the elevator is moving and cater to the requests in the order of the floor. For example, assume the elevator is at floor 5, and then someone pressed 0 followed by 3. The elevator should stop at 3 first before moving to 0.
- An emergency button should be provided to stop the elevator movement on the nearest floor.

THEORY

A push-button switch is connected to a GPIO pin as shown in Fig. 1. Whenever the button is pressed, the GPIO reads 0 (GND). When the button is released the GPIO reads 1 (VCC).

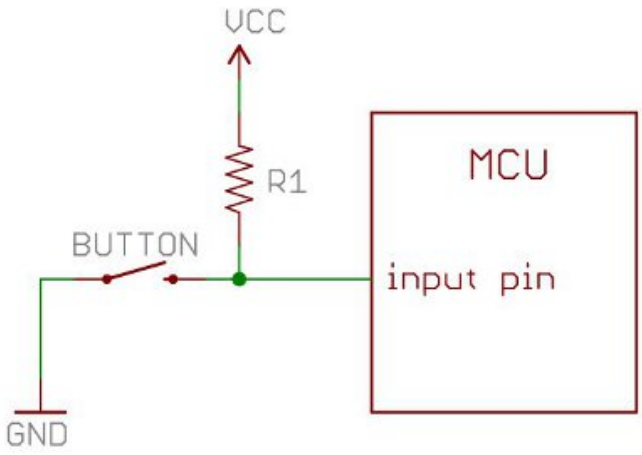

Fig. 1 Circuit diagram for push button

KL25Z MCU has an internal pull-up resistor for GPIO pins and can be enabled through the PORT control registers. The internal pull-up resistor can be used instead of connecting an external pull-up resistor on a breadboard.

Switch debouncing
When a push button switch is pressed, there is a fluctuation or bounce in the output voltage before the output settles to the ON/OFF state. This bouncing can be solved through hardware circuits or software code.
To debounce a switch in software, one method is to first read the switch state through the GPIO pin. Then wait for the debounce time (eg. 1 ms) and recheck the switch state. If the switch state remains stable, consider it a valid switch press or else repeat the process.

PROCEDURE

1. Connect the push button switches, LEDs and the seven-segment display to the KL25Z board. Ensure current limiting series resistors are used for the LEDs and the SSD.
2. Write a C program to implement the given specifications. Divide the code neatly using functions.