POST-LAB IOT Projects using Python (CSE 4110) ASSIGNMENT

Date:

Experiment – 5

Aim of the Experiment:

Physical Computation of different Embedded System Projects using push-button switch interfacing with Raspberry Pi and LEDs.

Objective:

1) Implementation of **mini pedestrian crossing system** (simple traffic light control system) using multiple LEDs without push-button.
2) Study the **effect of Multithreading concept** on processing time of an embedded system using Micro-python script (e.g. Comparing the processing time to calculate the **square and cube of a series of numbers** with and without multithreading concept).
3) Implementation of mini pedestrian crossing system with proper control (**Puffin Crossing System**) based on the concept of **multi-threading** using multiple LEDs with a push-button and a buzzer.
4) Implementation of **Single player** based **Simple Reaction Timing Game** (Mental Chronometry) based on the concept of Interrupt Requests, or IRQs using a push-button.
5) Implementation of **Two player** based Simple Reaction Timing Game (**Mental Chronometry**) based on the concept of **Interrupt Requests, or IRQs** using a push-button.
6) Implementation of **changing the LED flashing rate** using pushbutton as external interrupts with external and internal Pull-up resistors.
7) Implementation of a **Digital Dice Game** using LEDs and Push-buttons.
8) Implementation of **Lucky Day of the Week** using LEDs and Push-buttons.

Components/Equipment/items Required:

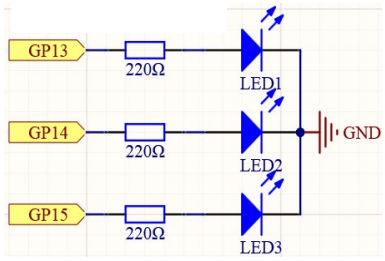
Sl No.	Name of the Component/Equipment	Specification	Quantity
1	Raspberry Pi Pico	RP2040 microcontroller chip, 125MHz	1
2	Raspberry Pi Pico cable	USB Type A to Micro-B	1
3	Resistors (carbon type)	¼ watt (330 Ω)	10
4	LED	3mm, Red	8
5	Tactile Push Button Switches	6 x 6 x 6 mm	2
6	Breadboard	840 Tie points	1
7	Jumper Wire	----------	As per requirement

POST-LAB IOT Projects using Python (CSE 4110) ASSIGNMENT

Experiment – 5

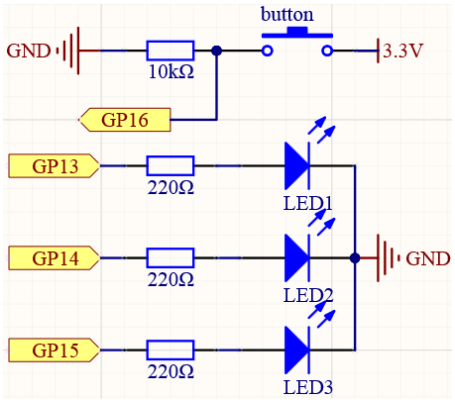
Circuit/Schematic Diagram:

Objective 1



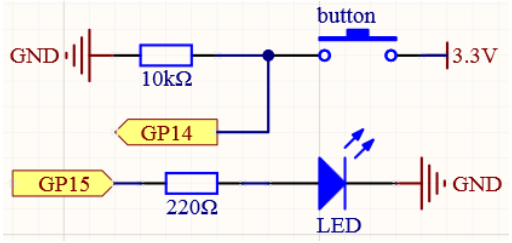
(Figure 1: Circuit diagram for implementation of mini pedestrian crossing system.)

Objective 3



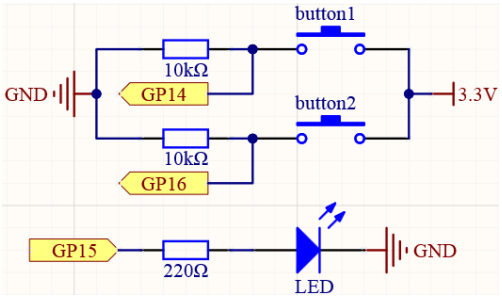
(Figure 2: Circuit diagram for implementation of Puffin crossing system.)

Objective 4



(Figure 3: Circuit diagram for implementation of Single player based Simple Reaction Timing Game.)

Objective 5

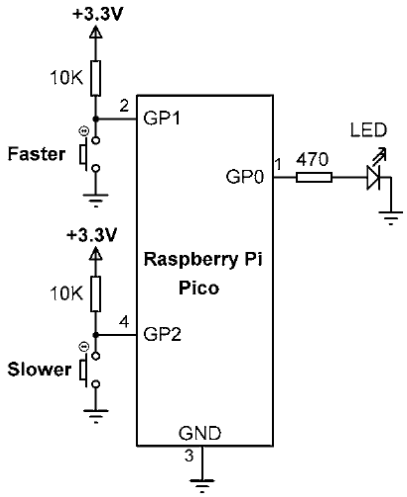


(Figure 4: Circuit diagram for implementation of Two player based Simple Reaction Timing Game.)

POST-LAB IOT Projects using Python (CSE 4110) ASSIGNMENT

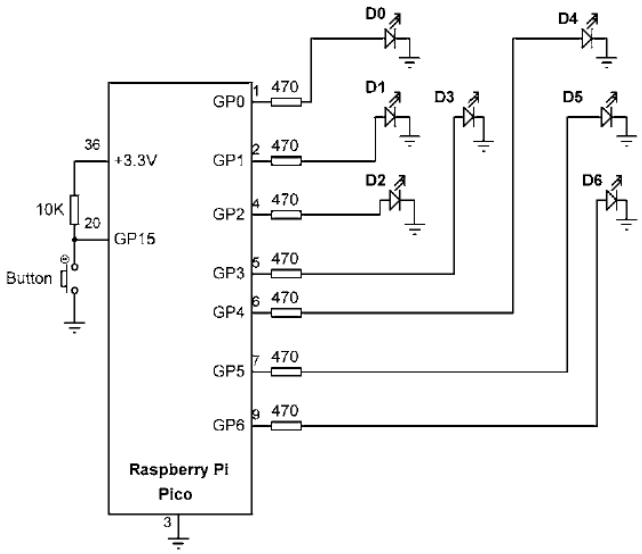
Experiment – 5

Objective 6



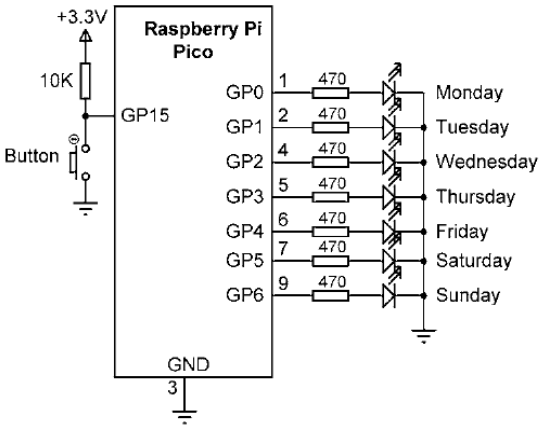
(Figure 5: Circuit diagram for implementation of changing the LED flashing rate using pushbutton with Pull-up resistors.)

Objective 7



(Figure 6: Circuit diagram for implementation of a Digital Dice Game using LEDs and Push-buttons.)

Objective 8



(Figure 7: Circuit diagram for implementation of Lucky Day of the Week using LEDs and Push-buttons.)

POST-LAB IOT Projects using Python (CSE 4110) ASSIGNMENT

Experiment – 5

Observation:

Objective 1

(Figure 8: Simulation based electronic circuit for implementation of mini pedestrian crossing system.)

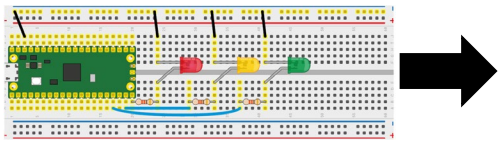


Figure 9: (Breadboard Schematic representation of an electronic circuit for implementation of mini pedestrian crossing system.)

Figure 10: (Hardware implementation based electronic circuit for implementation of mini pedestrian crossing system)

Objective 2

(Figure 11: Simulation based Comparing the processing time to calculate the square and cube of a series of numbers without multithreading concept.)

(Figure 12: Simulation based Comparing the processing time to calculate the square and cube of a series of numbers without multithreading concept.)

POST-LAB IOT Projects using Python (CSE 4110) ASSIGNMENT

Experiment – 5

Objective 3

(Figure 13: Simulation based electronic circuit for implementation of Puffin crossing system.)

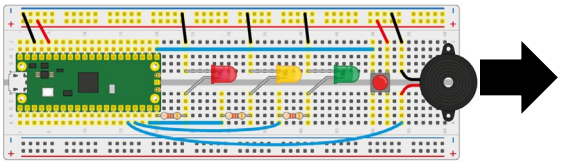


Figure 14: (Breadboard Schematic representation of an electronic circuit for implementation of Puffin crossing system.)

Figure 15: (Hardware implementation based electronic circuit for implementation of Puffin crossing system)

Objective 4

(Figure 16: Simulation based electronic circuit for implementation of Single player based Simple Reaction Timing Game.)

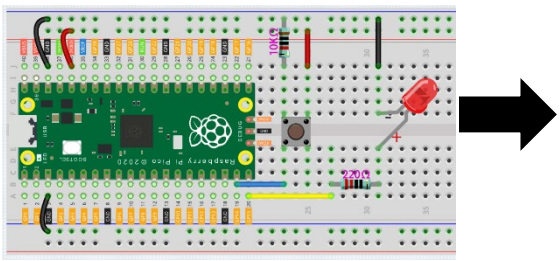


Figure 17: (Breadboard Schematic representation of an electronic circuit for implementation of Single player based Simple Reaction Timing Game.)

Figure 18: (Hardware implementation based electronic circuit for implementation of Single player based Simple Reaction Timing Game)

POST-LAB IOT Projects using Python (CSE 4110) ASSIGNMENT

Experiment – 5

Objective 5

(Figure 19: Simulation based electronic circuit for implementation of Two player based Simple Reaction Timing Game.)

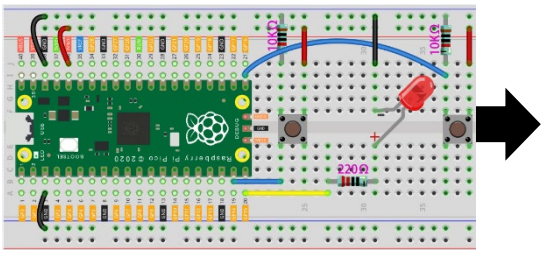


Figure 20: (Breadboard Schematic representation of an electronic circuit for implementation of Two player based Simple Reaction Timing Game.)

Figure 21: (Hardware implementation based electronic circuit for implementation of Two player based Simple Reaction Timing Game)

Objective 6

(Figure 22: Simulation based electronic circuit for changing the LED flashing rate using pushbutton with Pull-up resistors.)

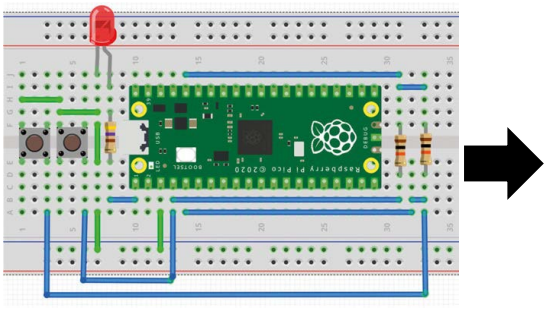


Figure 23: (Breadboard Schematic representation of an electronic circuit for changing the LED flashing rate using pushbutton with Pull-up resistors.)

Figure 24: (Hardware implementation based electronic circuit for changing the LED flashing rate using pushbutton with Pull-up resistors.)

POST-LAB IOT Projects using Python (CSE 4110) ASSIGNMENT

Experiment – 5

Objective 7

Figure 25: (Simulation based electronic circuit for implementation of a Digital Dice Game using LEDs and Push-buttons.)

Figure 26: (Hardware implementation based electronic circuit for implementation of a Digital Dice Game using LEDs and Push-buttons.)

Objective 8

Figure 27: (Simulation based electronic circuit for Lucky Day of the Week using LEDs and Push-buttons.)

Figure 28: (Hardware implementation based electronic circuit for Lucky Day of the Week using LEDs and Push-buttons.)

POST-LAB IOT Projects using Python (CSE 4110) ASSIGNMENT

Experiment – 5

Codes:

Objective 1

```
print("Hello, Pi Pico!")
print("This is Experiment - 5 and Objective - 1")
print("Name:                          ; Registration No.:                ")
print("Objective : 1  Implementation of mini pedestrian crossing system using multiple LEDs without push-button ")
```

Objective 2

```
print("Hello, Pi Pico!")
print("This is Experiment - 5 and Objective - 2")
print("Name:                          ; Registration No.:                ")
print("Objective : 2  Study the effect of Multithreading concept on processing time of an embedded system using Micro-python script ")
```

Objective 3

```
print("Hello, Pi Pico!")
print("This is Experiment - 5 and Objective - 3")
print("Name:                          ; Registration No.:                ")
print("Objective : 3   Implementation of Puffin Crossing System based on the concept of multi-threading using multiple LEDs with a push-button and a buzzer.")
```

POST-LAB IOT Projects using Python (CSE 4110) ASSIGNMENT

Experiment – 5

Objective 4

```
print("Hello, Pi Pico!")
print("This is Experiment - 5 and Objective - 4")
print("Name:                         ; Registration No.:                ")
print("Objective : 4   Implementation of Single player based Simple Reaction Timing Game based on the concept of Interrupt Requests, or IRQs using a push-button.”)
```

Objective 5

```
print("Hello, Pi Pico!")
print("This is Experiment - 5 and Objective - 5")
print("Name:                         ; Registration No.:                ")
print("Objective : 5   Implementation of Two player based Simple Reaction Timing Game based on the concept of Interrupt Requests, or IRQs using a push-button.")
```

Objective 6

```
print("Hello, Pi Pico!")
print("This is Experiment - 5 and Objective - 6")
print("Name:                         ; Registration No.:                ")
print("Objective : 6   Implementation of changing the LED flashing rate using pushbutton as external interrupts with external and internal Pull-up resistors.")
```

POST-LAB IOT Projects using Python (CSE 4110) ASSIGNMENT

Experiment – 5

Objective 7

```
print("Hello, Pi Pico!")
print("This is Experiment - 5 and Objective - 7")
print("Name:                          ; Registration No.:                ")
print("Objective : 7    Implementation of a Digital Dice Game using LEDs and
Push-buttons.")
```

Objective 8

```
print("Hello, Pi Pico!")
print("This is Experiment - 5 and Objective - 8")
print("Name:                          ; Registration No.:                ")
print("Objective : 8    Implementation of Lucky Day of the Week using LEDs and
Push-buttons.")
```

Conclusion:

Precautions:

POST-LAB IOT Projects using Python (CSE 4110) ASSIGNMENT

Experiment – 5

Post Experiment Questionnaire:

Answer all the Questions in brief with some appropriate examples.

1) List out the two main modules which can be used to handle threads in Python.
2) What is global interpreter lock (GIL) in Multi-threading?
3) Why interrupts? Differentiate between polling and interrupts through a real-life example.
4) Explain the RISING and FALLING in interrupts in Raspberry Pi.

Name of the Student
Registration No
Semester
Branch, Section