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

Date:

Experiment – 3

Aim of the Experiment:

Implementation of simple electronic projects using Raspberry Pi and LEDs.

Objective:

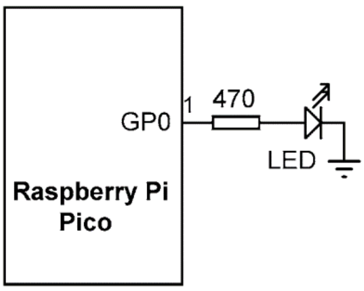
1) Implementation of a timer to blink an LED in different frequencies.
2) Implementation of two LEDs blink alternatively for every 250 milliseconds.
3) Implementation of rotating LED Lights display pattern of rotating to the left.
4) Implementation of a more efficient algorithm for rotating LEDs used for decoration at parties.
5) Implementation of a 4-bit binary counter to show numbers in binary using four LEDs.
6) Implementation of an 8-bit binary counter to show numbers in binary using eight LEDs.
7) Implementation of a randomly twinkled LED Diwali/Christmas lights blink randomly for every 250 milliseconds.

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 (470 Ω)	8
4	LED	3mm, Red	8
5	Breadboard	840 Tie points	1
6	Jumper Wire	--------------------------	As per requirement

Circuit/Schematic Diagram:

Objective 1



(Figure 1: Circuit diagram for implementation of a timer to blink an LED in different frequencies.)

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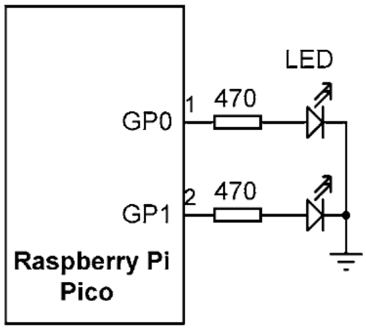
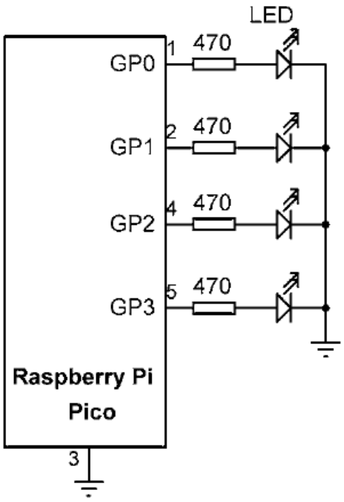
Objective 2



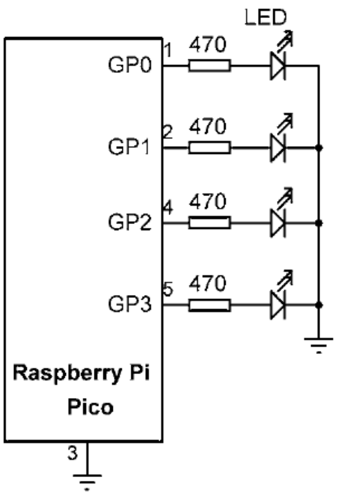
(Figure 2: Circuit diagram for two LEDs blink alternatively every 250 milliseconds.)

Objective 3



(Figure 3: Circuit diagram for rotating LED Lights display pattern of rotating to the left.)

Objective 4



(Figure 4: Circuit diagram for a more efficient algorithm to rotate LEDs used for decoration at parties.)

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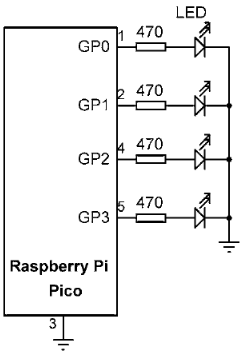
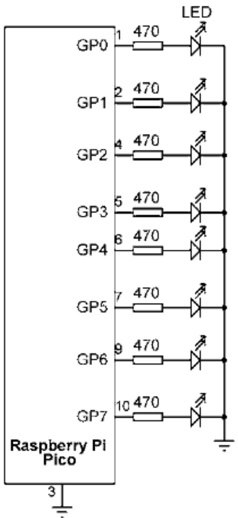
Objective 5



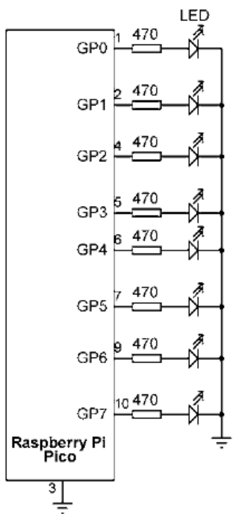
(Figure 5: Circuit diagram for a 4-bit binary counter to show numbers in binary using four LEDs.)

Objective 6



(Figure 6: Circuit diagram for an 8-bit binary counter to show numbers in binary using eight LEDs.)

Objective 7



(Figure 7: Circuit diagram for a randomly twinkled LED Diwali/Christmas lights blink randomly for every 250 milliseconds.)

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Experiment – 3

Observation:

Objective 1

(Figure 8: Simulation based electronic circuit for implementation of a timer to blink an LED in different frequencies.)

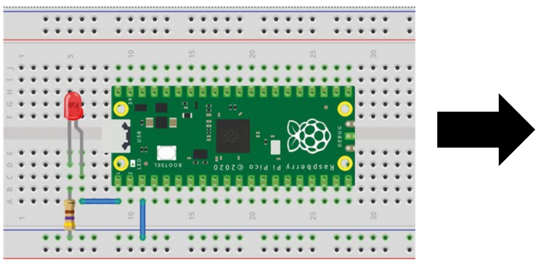

Figure 9: (Breadboard Schematic representation of an electronic circuit for implementation of a timer to blink an LED in different frequencies.)

Figure 10: (Hardware implementation based electronic circuit for implementation of a timer to blink an LED in different frequencies)

Objective 2

(Figure 11: Simulation based electronic circuit for two LEDs blink alternatively every 250 milliseconds.)

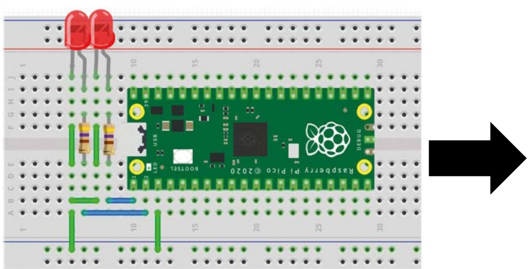

Figure 12: (Breadboard Schematic representation of an electronic circuit for two LEDs blink alternatively every 250 milliseconds.)

Figure 13: (Hardware implementation based electronic circuit for two LEDs blink alternatively every 250 milliseconds)

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Experiment – 3

Objective 3

(Figure 14: Simulation based electronic circuit for rotating LED Lights display pattern of rotating to the left.)

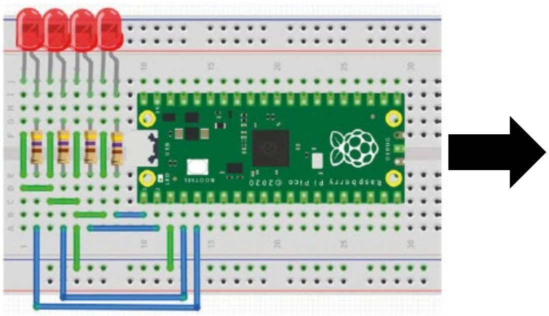

Figure 15: (Breadboard Schematic representation of an electronic circuit for rotating LED Lights display pattern of rotating to the left.)

Figure 16: (Hardware implementation based electronic circuit for rotating LED Lights display pattern of rotating to the left)

Objective 4

(Figure 17: Simulation based electronic circuit for a more efficient algorithm to rotate LEDs used for decoration at parties.)

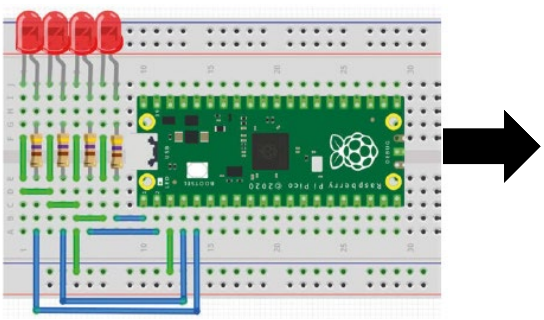

Figure 18: (Breadboard Schematic representation of an electronic circuit for a more efficient algorithm to rotate LEDs used for decoration at parties.)

Figure 19: (Hardware implementation based electronic circuit for a more efficient algorithm to rotate LEDs used for decoration at parties)

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Experiment – 3

Objective 5

(Figure 20: Simulation based electronic circuit for a 4-bit binary counter to show numbers in binary using four LEDs.)

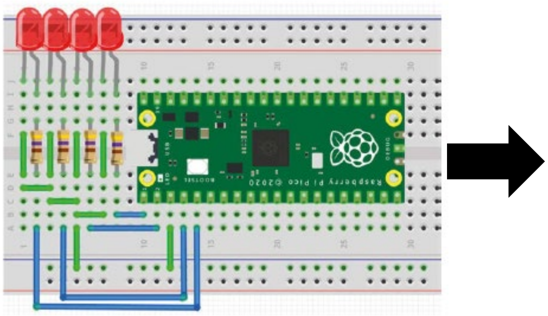

Figure 21: (Breadboard Schematic representation of an electronic circuit for a 4-bit binary counter to show numbers in binary using four LEDs.)

Figure 22: (Hardware implementation based electronic circuit for a 4-bit binary counter to show numbers in binary using four LEDs.)

Objective 6

Figure 23: (Simulation based electronic circuit for an 8-bit binary counter to show numbers in binary using eight LEDs.)

Figure 24: (Hardware implementation based electronic circuit for an 8-bit binary counter to show numbers in binary using eight LEDs.)

Experiment – 3

Objective 7

Figure 25: (Simulation based electronic circuit for a randomly twinkled LED Diwali/Christmas lights blink randomly for every 250 milliseconds.)

Figure 26: (Hardware implementation based electronic circuit for a randomly twinkled LED Diwali/Christmas lights blink randomly for every 250 milliseconds.)

Codes:

Objective 1

```
print("Hello, Pi Pico!")
print("This is Experiment - 3 and Objective - 1")
print("Name:                              ; Registration No.:                   ")
print("Objective : 1  Implementation of a timer to blink an LED in different frequencies.")
```

Experiment – 3

Objective 2

```
print("Hello, Pi Pico!")
print("This is Experiment - 3 and Objective - 2")
print("Name:                          ; Registration No.:                   ")
print("Objective : 2   Implementation of two LEDs blink alternatively for every 250 milliseconds.")
```

Objective 3

```
print("Hello, Pi Pico!")
print("This is Experiment - 3 and Objective - 3")
print("Name:                          ; Registration No.:                   ")
print("Objective : 3   Implementation of rotating LED Lights display pattern of rotating to the left.")
```

Objective 4

```
print("Hello, Pi Pico!")
print("This is Experiment - 3 and Objective - 4")
print("Name:                          ; Registration No.:                   ")
print("Objective : 4   Implementation of a more efficient algorithm for rotating LEDs used for decoration at parties.")
```

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Experiment – 3

Objective 5

```
print("Hello, Pi Pico!")
print("This is Experiment - 3 and Objective - 5")
print("Name:                            ; Registration No.:                   ")
print("Objective : 5   Implementation of a 4-bit binary counter to show numbers in binary using four LEDs.")
```

Objective 6

```
print("Hello, Pi Pico!")
print("This is Experiment - 3 and Objective - 6")
print("Name:                            ; Registration No.:                   ")
print("Objective : 6   Implementation of a 8-bit binary counter to show numbers in binary using eight LEDs.")
```

Objective 7

```
print("Hello, Pi Pico!")
print("This is Experiment - 3 and Objective - 7")
print("Name:                            ; Registration No.:                   ")
print("Objective : 7   Implementation of a randomly twinkled LED Diwali/Christmas lights blink randomly for every 250 milliseconds.")
```

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Experiment – 3

Conclusion:

Precautions:

Post Experiment Questionnaire:

1) What are the possible reasons that half of my Christmas/Diwali lights out?
2) Is there a standard length of LED mini light strand? I know light sets come in strands of 50,100 and even higher, but is there one standard length?
3) Is the reason one bad bulb can take out an entire series of lights is that it breaks the circuit? Is that true of all light strands?
4) In digital logic, a counter is a device which ____________
   a) Counts the number of outputs
   b) Stores the number of times a particular event or process has occurred
   c) Stores the number of times a clock pulse rises and falls
   d) Counts the number of inputs
5) A counter circuit is usually constructed of ____________
   a) A number of latches connected in cascade form
   b) A number of NAND gates connected in cascade form
   c) A number of flip-flops connected in cascade
   d) A number of NOR gates connected in cascade form
6) What is the maximum possible range of bit-count specifically in n-bit binary counter consisting of 'n' number of flip-flops?
   a) 0 to 2^n
   b) 0 to $2^n + 1$
   c) 0 to $2^n – 1$
   d) 0 to $2^{n+1/2}$
7) A decimal counter has ______ states.
   a) 5
   b) 10

c) 15

d) 20

8) The representation of octal number $(532.2)_8$ in decimal is ________

a) $(346.25)_{10}$

b) $(532.864)_{10}$

c) $(340.67)_{10}$

d) $(531.668)_{10}$

9) The decimal equivalent of the binary number $(1011.011)_2$ is ________

a) $(11.375)_{10}$

b) $(10.123)_{10}$

c) $(11.175)_{10}$

d) $(9.23)_{10}$

10) An important drawback of binary system is ________

a) It requires very large string of 1's and 0's to represent a decimal number

b) It requires sparingly small string of 1's and 0's to represent a decimal number

c) It requires large string of 1's and small string of 0's to represent a decimal number

d) It requires small string of 1's and large string of 0's to represent a decimal number

11) The largest two-digit hexadecimal number is ________

a) $(FE)_{16}$

b) $(FD)_{16}$

c) $(FF)_{16}$

d) $(EF)_{16}$

12) The given hexadecimal number $(1E.53)_{16}$ is equivalent to ____________

a) $(35.684)_8$

b) $(36.246)_8$

c) $(34.340)_8$

d) $(35.599)_8$

= $(36.246)_8$.

13) The octal number $(651.124)_8$ is equivalent to ______

a) $(1A9.2A)_{16}$

b) $(1B0.10)_{16}$

c) $(1A8.A3)_{16}$

d) $(1B0.B0)_{16}$

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14) The octal equivalent of the decimal number $(417)_{10}$ is _____

a) $(641)_8$

b) $(619)_8$

c) $(640)_8$

d) $(598)_8$

15) Convert $(0.345)_{10}$ into an octal number.

a) $(0.16050)_8$

b) $(0.26050)_8$

c) $(0.19450)_8$

d) $(0.24040)_8$

Name of the Student
Registration No
Semester
Branch, Section