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

Date:

Experiment – 2

Aim of the Experiment:

Identification and verification of different basic electronic components and implementation of an efficient electronic circuit in which an external LED with buzzer sends the SOS signal in Morse code using Raspberry Pi Pico and a transistor.

Objective:

1) Understanding basics of electronics and its components/items such as Breadboard, Resistors, Capacitors, Potentiometer, Battery, Diodes, Transistors, Switches etc.
2) Understanding and analysis of Resistance Measurement technique using Resistance Colour Code and the concept of tolerance limit.
3) Identification and verification of Diodes and Transistors.
4) Implementation of an electronic circuit in which an external LED flashes the SOS signal in Morse code (**three dots, followed by three dashes, followed by three dots**) continuously using Raspberry Pi Pico. A **dot** is represented with the LED being **ON for 0.25 seconds** (Dot time) and a **dash** is represented with the LED being **ON for 1 second** (Dash time). The delay between the dots and dashes is set to **0.5 second (GAP time)**. This process is repeated continuously after **2 seconds of delay.**
5) Implementation of a more efficient electronic circuit in which an external LED with buzzer sends the SOS signal in Morse code using Raspberry Pi Pico and a transistor.

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 (220 Ω, 330Ω, 470 Ω, 1k, 2.2k, 4.7k, 10k)	1 each
4	LED	3mm, Red, Blue, Green	1 each
5	Diode (Si diode)	1N4148	1
6	Transistor	2N2222, BC 108, BC 548	1 each
7	Buzzer	Active	1
8	Breadboard	840 Tie points	1
9	Digital Multimeter	----------	1
10	Jumper Wire	----------	As per requirement

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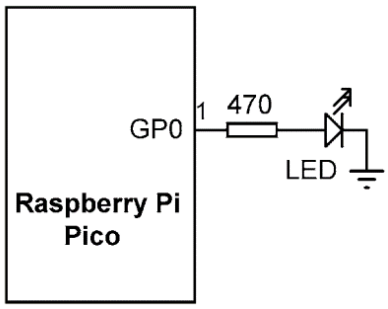
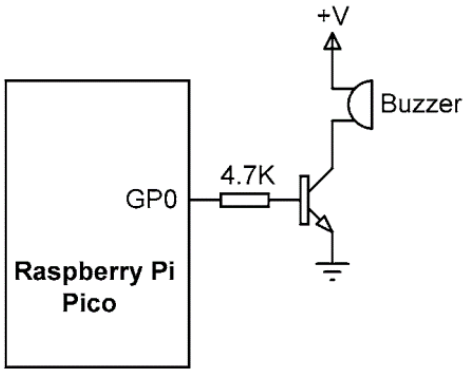
Circuit/Schematic Diagram:

Objective 4



(Figure 1 : Circuit diagram for an external LED flashes the SOS signal in Morse code)

Objective 5



(Figure 2: Circuit diagram to blink an external LED with buzzer sends the SOS signal in Morse code using Raspberry Pi Pico and a transistor.)

Observation:

Objective 2

Table 1: (Resistance Measurement)

Sl No.	Colour code of resistors	Theoretical/colour code value, T	Measured Value (DMM), M	% of error = $\frac{M-T}{T} \times 100$	Remark
1	Red, Black, Orange, Gold				
2					
3					
4					
5					

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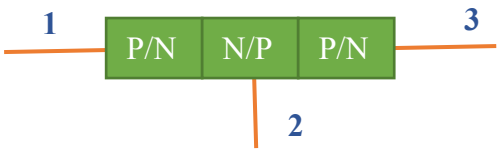
Objective 3

Table 2: (Diode Verification)

Sl No.	Type of Diode	Forward Bias Voltage	Reverse Bias Voltage	Remark
1	1N4148 (Silicon Diode)			
2	Red LED			
3	Blue LED			
4	Green LED			

Table 3: (Transistor Verification)



Transistor Schematic Diagram

Unknown Transistors	Biasing	Voltage between Terminal 1 & 2 (V_1)	Voltage between Terminal 2 & 3 (V_2)	Type of Transistor (NPN or PNP)	$V_1 > V_2$	$V_2 > V_1$	Remark
Unknown Transistor 1	**Forward Bias**				1 : _____ 2: _____ 3: _____	1 : _____ 2: _____ 3: _____	
	Reverse Bias						
Unknown Transistor 2	**Forward Bias**				1 : _____ 2: _____ 3: _____	1 : _____ 2: _____ 3: _____	
	Reverse Bias						

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Experiment – 2

Objective 4

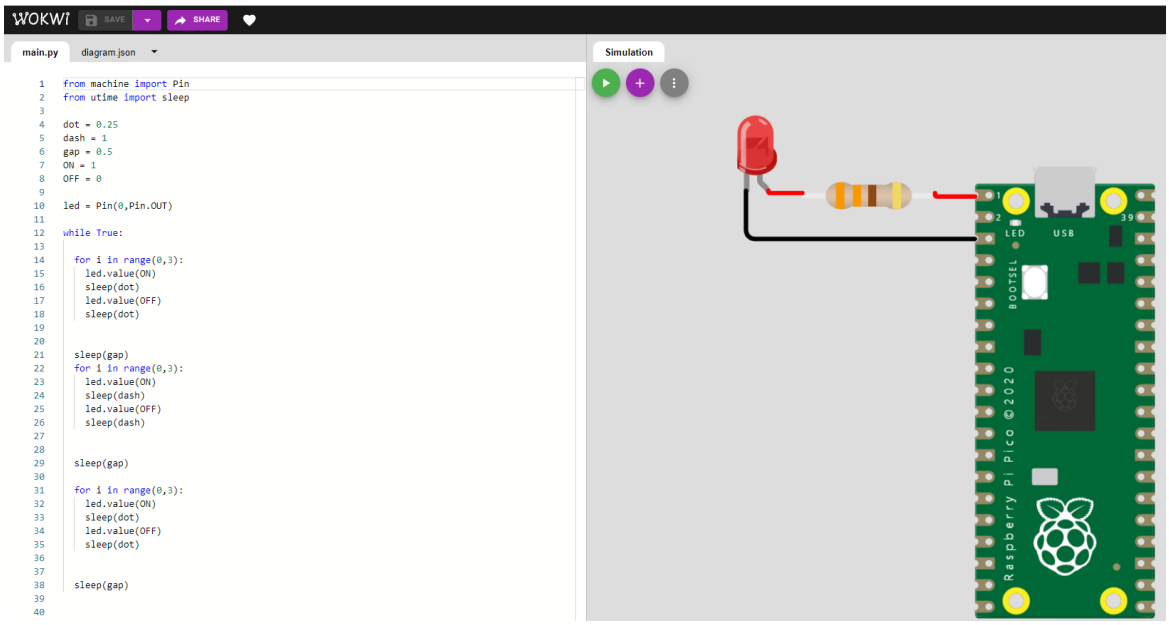

Figure 3: (Simulation based electronic circuit in which an external LED flashes the SOS signal in Morse code.)

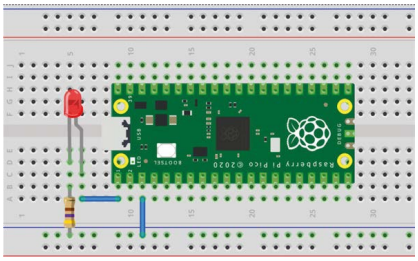

Figure 4: (Breadboard Schematic representation of an electronic circuit in which an external LED flashes the SOS signal in Morse code.)

Figure 5: (Hardware implementation based electronic circuit in which an external LED flashes the SOS signal in Morse code.)

Objective 5

Figure 5: (Hardware Implementation based more efficient electronic circuit in which an external LED with buzzer sends the SOS signal in Morse code using Raspberry Pi Pico and a transistor)

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Experiment – 2

Codes:

Objective 4

```
print("Hello, Pi Pico!")
print("This is Experiment - 2 and Objective - 4")
print("Objective : 4  Implementation of an electronic circuit in which an external LED flashes the SOS signal in Morse code (three dots, followed by three dashes, followed by three dots) continuously using Raspberry Pi Pico. A dot is represented with the LED being ON for 0.25 seconds (Dot time) and a dash is represented with the LED being ON for 1 second (Dash time). The delay between the dots and dashes is set to 0.5 second (GAP time). This process is repeated continuously after 2 seconds of delay.")


from machine import Pin
from utime import sleep

dot = 0.25
dash = 1
gap = 0.5
ON = 1
OFF = 0

led = Pin(0,Pin.OUT)

while True:

  for i in range(0,3):
    led.value(ON)
    sleep(dot)
    led.value(OFF)
    sleep(dot)

  sleep(gap)
  for i in range(0,3):
    led.value(ON)
    sleep(dash)
    led.value(OFF)
    sleep(dash)

  sleep(gap)

  for i in range(0,3):
    led.value(ON)
    sleep(dot)
    led.value(OFF)
    sleep(dot)

  sleep(gap)
```

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Experiment – 2

Objective 5

```
print("Hello, Pi Pico!")
print("This is Experiment - 2 and Objective - 5")
print("Objective : 5 Implementation of a more efficient electronic circuit in which an external LED with buzzer sends the SOS signal in Morse code using Raspberry Pi Pico and a transistor.")


from machine import Pin
from utime import sleep

dot = 0.25
dash = 1
gap = 0.5
ON = 1
OFF = 0

led = Pin(0,Pin.OUT)

while True:

  for i in range(0,3):
    led.value(ON)
    sleep(dot)
    led.value(OFF)
    sleep(dot)

  sleep(gap)
  for i in range(0,3):
    led.value(ON)
    sleep(dash)
    led.value(OFF)
    sleep(dash)

  sleep(gap)

  for i in range(0,3):
    led.value(ON)
    sleep(dot)
    led.value(OFF)
    sleep(dot)

  sleep(gap)
```

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Experiment – 2

Conclusion:

Precautions:

Post Experiment Questionnaire:

1) What is the value of the electrical resistance of the resistor with colour rings as follows?

a. Yellow, violet, red, and gold

b. orange, white, brown, and gold

c. green, blue, yellow, and silver

d. brown, black, green, and colourless

e. red, red, red, and gold

f. Brown, Black, Black, Yellow, Brown

g. Red, Red, Red, Red, Red

h. Yellow, Violet, Red, Black, Brown

i. Blue, Grey, White, Orange, Silver

j. Black, Blue, Orange, Brown, Gold

2) What colour rings on the body of the resistor, the value of resistance mentioned below (ignoring the value of tolerance)?

a. 33 Ω; **b**. 200 kΩ; **c**. 750 Ω; **d.** 43 kΩ; **e.** 1.2 MΩ

3) Decode the following letter coded resistor.

a. R47; **b**. 1R0; **c**. 4R7; **d**. 47R; **e**. 0K47; **f**. 1K0; **g**. 4K7; **h**. 0M47; **i**. 1M0

4) Decode the following letter coded ceramic capacitor

a. 10; **b**. 474K; **c**. 1n0; **d**. 6n8; **e**. p68; **f.** n15 **g**. 5p0; **h**. 100; **i.** 3R9

5) If the length of the terminals of these devices are same, then how can you identify the polarity for LED and Electrolytic capacitors?

(i) with Digital multimeter

(ii) without Digital Multimeter

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6) True/ False

i) While testing voltage, the mulitmeter is connected to the tested component in a parallel connection?

ii) Continuity testing is similar to resistance testing.

iii) No damage or injury can occur when misusing a multimeter.

iv) There is no requirement of current for operation of diode. Diode only needs voltage to operate.

7) a) What is the difference between True RMS reading and peak to peak reading and give example of one device which is used to measure:

i) True RMS voltage

ii) Peak to peak voltage

b) Differentiate between amplitude and peak to peak voltage.

c) Convert 2-volt V_{P-P} to V_{RMS}.

8) Select any one CORRECT answer from the following given choices.

i) An ideal ammeter has …… resistance

a) Low **b)** Infinite **c)** Zero **d)** High

ii) The resistance of an ideal voltmeter is ……

a) Low **b)** Infinite **c)** Zero **d)** High

iii) The sensitivity of a multimeter is given in …….

a) Ω **b)** Amperes **c)** kΩ/V **d)** none of the above

iv) A voltmeter is connected in a ……. with the circuit component across which potential difference is to be measured

a) Parallel **b)** Series **c)** Series or parallel **d)** None of the above

v) An ammeter is connected in ……. with the circuit element whose current we wish to measure

a) Series **b)** Parallel **c)** Series or parallel **d)** None of the above

vi) A transistor has ……..PN junctions?

a) 1 **b)** 2 **c)** 3 **d)** 4

Name of the Student
Registration No
Semester
Branch, Section