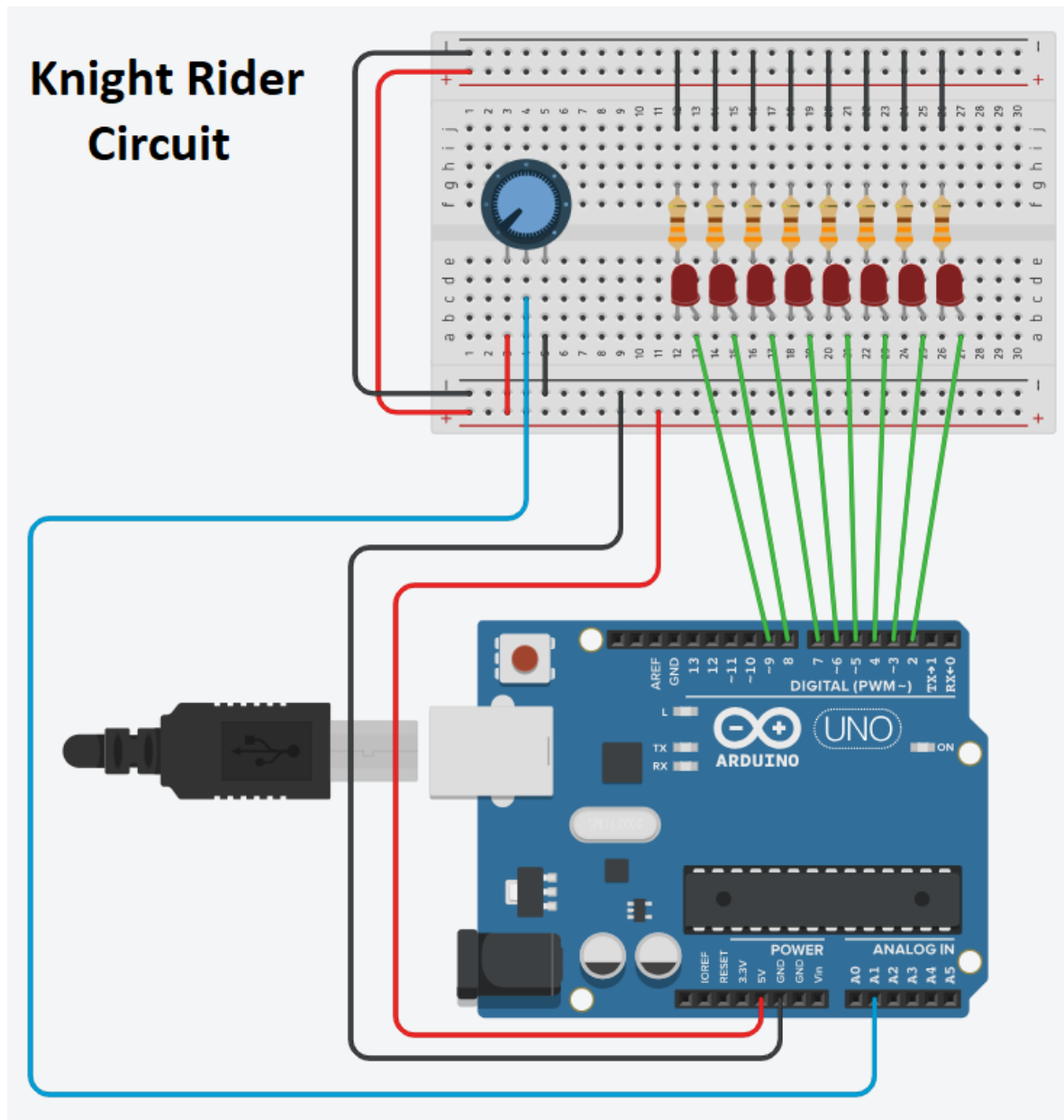


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MID-TERM EXAM: BME342 MICROCONTROLLERS AND APPLICATIONS

15 April 2024

- 1- In the following circuit, a potentiometer is connected to the A1 pin and 8 LEDs are connected to D2-D9 pins of the Arduino Uno. Please, write an Arduino C code
- a. to illuminate single LED from left to right direction until it reaches to the right-most one, and from right to left direction until it reaches to the left-most one,
 - b. delay between each LED lightning from 500 milliseconds to 3000 milliseconds varying by the value of the potentiometer.
- User can change the delay value anytime, and this change must affect immediately by the next lightning (not necessary to wait for completing all LEDs):

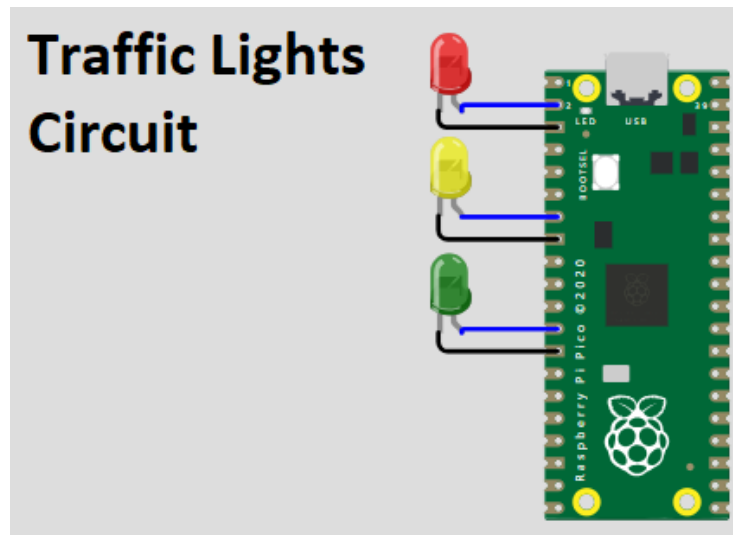


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2- In the following circuit, Red LED is connected to GP1, Yellow LED is connected to GP5, and Green LED is connected to GP9 of the Raspberry Pi Pico. Please, write a CircuitPython (or MicroPython) program that LEDs should be lightened in the following order until the electricity is down:

- a. Red only for 28 seconds,
- b. Red and Yellow together for 3 seconds,
- c. Green only for 30 seconds, and
- d. Yellow only for 3 seconds.



GOOD LUCK!

Assoc. Prof. Yalcin ISLER

Duration: 60 minutes.

Grades: The first question is 60 points, and the second one is 40 points.

P.S.: All documents and electronic devices are forbidden during the exam.

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// ANSWER #1: <https://www.tinkercad.com/things/ghGeCKh2jQH-arduino-knight-rider-circuit-with-adjustable-delay/editel>

```
#define POT A1

int LED[8] = {9, 8, 7, 6, 5, 4, 3, 2};

int delayTime;
int iLed = -1;
int iDirection = 1; // 1: Left to right
                  // -1: Right to left

void setup() {
    for (int i = 0; i < 8; i++) {
        pinMode(LED[i], OUTPUT);
        digitalWrite(LED[i], LOW);
    }
    Serial.begin(9600);
}

void loop() {
    calculate_delay_time();
    show_next_led();
    report_serial();
    delay(delayTime);
}

void calculate_delay_time() {
    int potValue = analogRead(POT);
    delayTime = map(potValue, 0, 1023, 500, 3000);
}

void show_next_led() {
    if (iLed <= 0) iDirection = 1;
    else if (iLed >= 7) iDirection = -1;
    iLed += iDirection;
    for (int i = 0; i < 8; i++) digitalWrite(LED[i], LOW);
    digitalWrite(LED[iLed], HIGH);
}

void report_serial() {
    Serial.print("LED #");
    Serial.print(iLed+1);
    Serial.print(" is ON with the delay of ");
    Serial.print(delayTime);
    Serial.println(" ms.");
}
```

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ANSWER #2: <https://wokwi.com/projects/395405993152174081>

```
import time
import board
import digitalio

RED = board.GP1
YELLOW = board.GP5
GREEN = board.GP9

ledRed = digitalio.DigitalInOut(RED)
ledRed.direction = digitalio.Direction.OUTPUT
ledRed.value = False

ledYellow = digitalio.DigitalInOut(YELLOW)
ledYellow.direction = digitalio.Direction.OUTPUT
ledYellow.value = False

ledGreen = digitalio.DigitalInOut(GREEN)
ledGreen.direction = digitalio.Direction.OUTPUT
ledGreen.value = False

while True:
    ledRed.value = True
    time.sleep(28)

    ledYellow.value = True
    time.sleep(3)

    ledRed.value = False
    ledYellow.value = False
    ledGreen.value = True
    time.sleep(30)

    ledGreen.value = False
    ledYellow.value = True
    time.sleep(3)

    ledYellow.value = False
```