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Practice 01: PWM

Filter:

The formula for the frequency is the following, from which, we can clear for the value of the capacitor:

$$Fc = \frac{1}{RC(2\pi)} \therefore C = \frac{1}{RFc(2\pi)}$$

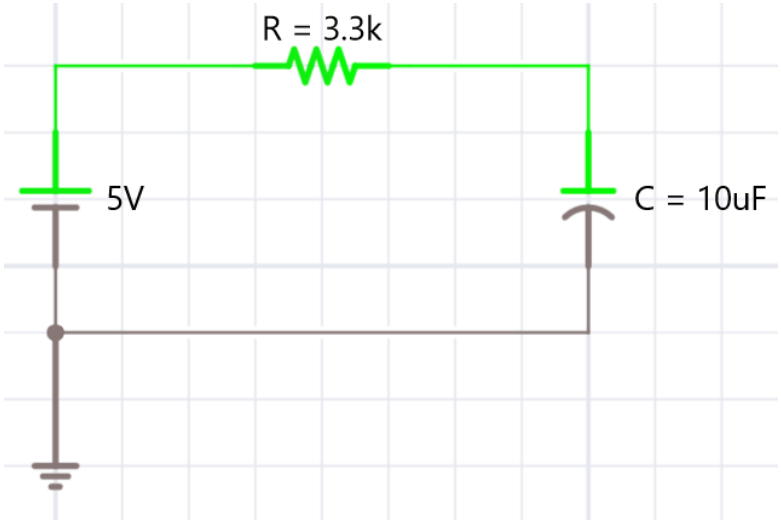
We propose a resistance of 3.3KΩ and when measuring it with a multimeter it gives us a real value of $3.26K\Omega$. Thus, we replace in the previous formula to obtain the value of the capacitor, which gives us a value of:

$$C = \frac{1}{(5Hz)(3.26K\Omega)(2\pi)} = 9.76\mu F$$

When looking for a capacitor of $10\ \mu F$ as a commercial value, we measure it to obtain its real value, which is $9.86\mu F$. Therefore, we recalculated the frequency, to know how accurate the filter will be, the result is as follows. Very accurate:

$$Fc = \frac{1}{(3.26K\Omega)(9.86\mu F)(2\pi)} = 4.95Hz$$

Therefore, we have the following circuit:



In addition, we add a voltage follower to the filter. We use a UA741CP (741).

Code:

Regarding the code used in the Arduino, we generate the following:

```
void setup() {
  // initialize the serial communication:
  Serial.begin(9600);
   // initialize the pin 10 as the PWM output:
  pinMode(10, OUTPUT);
}

void loop() {
  // check if data has been sent from the computer:
  if (Serial.available()) {
    // read the Serial String:
    String x = Serial.readString();
    //Check if the format is ok:
    if(x>="0" && x<="5.1")
    {
      //Converting the variable of the input from String to Float:
      float y=x.toFloat();
      //Checking if the value of the input is ok:
      if(y>=0.0 && y<=5.0)
      {
        //Making the convertion:
        y=(y*255.0)/5.0;
        //PWM on the output (pin 10):
        analogWrite(10,y);
        //Print on Serial Monitor:
        Serial.print("Generando PWM de: ");
        Serial.println(y);
      }
      else
        Serial.println("Rango incorrecto");
    }
    else
      Serial.println("Error de formato");
  }
}
```