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CSE 34468
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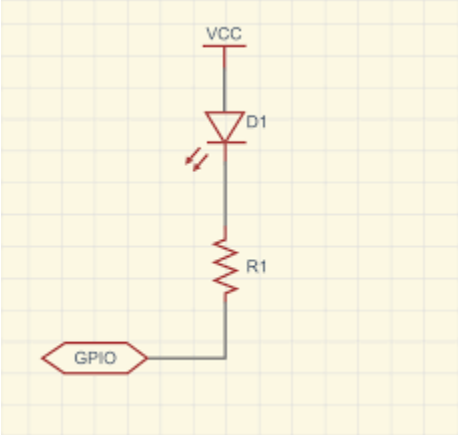
Homework 2

1. What does it mean to sink current?

Sink current flows from the power supply to some load and finally into the device. When the sunk pin is switched to high the current going to the load is turned off. When the sunk pin is switched to low, the current can go through and power the device.

2. Show an example circuit where a GPIO pin of the Raspberry Pi is used to turn on a LED in a current sink configuration.



In this configuration, the GPIO pin is used as the ground acting as a sink.

3. Use the example code to set up an example where the light is turned on whenever the button is pressed.

```
# External module imports
import RPi.GPIO as GPIO
import time

# Pin Definitons:
pwmPin = 18 # Broadcom pin 18 (P1 pin 12)
ledPin = 23 # Broadcom pin 23 (P1 pin 16)
butPin = 17 # Broadcom pin 17 (P1 pin 11)

dc = 95 # duty cycle (0-100) for PWM pin

# Pin Setup:
GPIO.setmode(GPIO.BCM) # Broadcom pin-numbering scheme
GPIO.setup(ledPin, GPIO.OUT) # LED pin set as output
GPIO.setup(pwmPin, GPIO.OUT) # PWM pin set as output
pwm = GPIO.PWM(pwmPin, 50)  # Initialize PWM on pwmPin 100Hz frequency
GPIO.setup(butPin, GPIO.IN, pull_up_down=GPIO.PUD_UP) # Button pin set as input w/
pull-up
```

```
# Initial state for LEDs:
GPIO.output(ledPin, GPIO.LOW)
pwm.start(dc)

print("Here we go! Press CTRL+C to exit")
try:
    while 1:
        if GPIO.input(butPin)==GPIO.LOW: # button is pressed
            GPIO.output(ledPin, GPIO.HIGH)
        else: # button is released:
            GPIO.output(ledPin, GPIO.LOW)
        time.sleep(0.075)
except KeyboardInterrupt: # If CTRL+C is pressed, exit cleanly:
    pwm.stop() # stop PWM
    GPIO.cleanup() # cleanup all GPIO
```

4. What is the difference between a pull-up and a pull-down resistor? Why are they needed?

A pull-up resistor keeps the pin at HIGH(logical 1) voltage while a pull-down resistor brings an input pin to LOW(logical 0). We need these to keep a pin at a constant high or low and detect if something happens to the circuit like a button pressed.

5. If we want to have a 70% duty cycle, what are the number of ticks to wait in for the high state and the low state?

The effective clock speed is 31.25 KHz.
Period = 1/60 = 0.017 s
31250*0.017s = 521 ticks
521*0.7 = 365 HIGH,
521*0.3 =156 LOW

6. The scale is able to operate on AA batteries but yet uses WiFi to stay directly connected to the Internet. Why might this be a viable design choice?

The scale does not need to be continuously connected to the internet, instead, the device can use an interrupt to turn on when it is stepped on. While on it will gather all the information necessary and send that information to the cloud using WiFi so it can show up in the app for the scale. By only turning it on when prompted to the scale can save charge and operate using only batteries.

7. Potential Partners For Final Project

I do not have anyone in mind currently for this project, I would be open to working with anyone.

8. Topics for Final Project

For the final project, I would be interested in looking at Smart Home technology or Green building design.