



1 Device Lifetime

Recent submission on 13:44 01 Oct 2020 Result: PASSED   || Manual  : 0/20 (incomplete)

Current

Recent

All

Average Device Lifetime (20 points)

A data acquisition device consists of three main parts: a CPU, a radio module, and a sensor. These components have current consumption characteristics as follow:

Component	Mode of operation	Current consumption	Time spent in this mode
CPU	active	15 mA	5%
	sleep	0.01 mA	95%
Radio module	transmitting	100 mA	1%
	receiving	10 mA	15%
	idle	5 mA	84%
Sensor	active	30 mA	5%
	inactive	0 mA	95%

Answer the following questions:

1. [4 pts] What is the average current consumption of the CPU?

mA




Please show your work.

2. [4 pts] What is the average current consumption of the radio module?

mA

Please show your work.

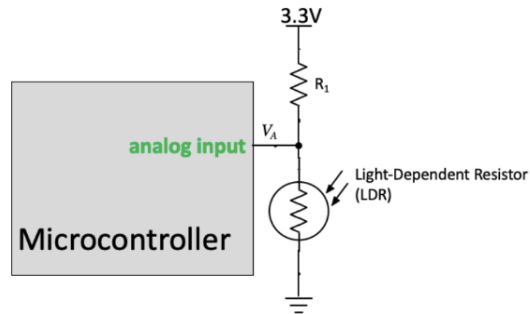
2 Light Measurement

Recent submission on 13:38 01 Oct 2020 Result: PASSED   || Manual  : 0/20 (incomplete)

Current Recent All

Light Measurement (20 points)

A light-dependent resistor (LDR) is wired to an ADC pin of a microcontroller as shown below.



Given the following:

- The ADC has 8-bit resolution.
- The ADC can measure input voltage within the range of 0V - 3.3V.
- The value of R_1 is 10000 ohms.

Suppose the digital value read from the ADC is 108. Answer the following questions.

1. [5 pts] The input voltage, V_A , is V.

Please show your work.

2. [5 pts] The current passing through the resistor R_1 and LDR is mA.

Hint: ideally, current flowing into and out from any input pin is zero.

Please show your work.

Given the following:

- The ADC has 8-bit resolution.
- The ADC can measure input voltage within the range of 0V - 3.3V.
- The value of R1 is 10000 ohms.

Suppose the digital value read from the ADC is 108. Answer the following questions.

1. [5 pts] The input voltage, V_A , is V.

Please show your work.

2. [5 pts] The current passing through the resistor R1 and LDR is mA.

Hint: ideally, current flowing into and out from any input pin is zero.

Please show your work.

3. [5 pts] The resistance of the LDR is ohms.

Please show your work.

4. [5 pts] Suppose the LDR's model is the one shown in [this datasheet](#). The light intensity measured by the LDR is approximately l

Please explain how you got the answer.

Submit

3 IoT Device Programming

Recent submission on 15:58 01 Oct 2020 Result: PASSED

Current Recent All

IoT Device Programming (40 points)

Write a MicroPython program for your KidBright board to perform all the following:

- [5 pts] Initially turn the on-board red and green LEDs off.
- [5 pts] Connect to the Wi-Fi network **KUWIN**; once connected, turn the red LED on.
- [5 pts] Connect to the broker on **iot.cpe.ku.ac.th** with a unique client ID; once connected, turn the green LED on.
- [5 pts] Subscribe to the topic **daq2020/midterm/student-id/blink**, where **student-id** is your KU student ID. Upon receiving a published number on this topic:
 - Blink the on-board red LED for the number of times specified in the message's payload, which can be any integer from 1 to 10.
 - Each blinking consists of LED being on for 250 ms and off for 750 ms.
- [5 pts] Count how many times the button S1 has been pressed. Whenever the button is pressed, publish the number of times the button has been pressed since reset to the topic **daq2020/midterm/student-id/count**.
- [5 pts] Continually publish button count even when the red LED is currently blinking.
- [5 pts] If red LED blinking is not currently ongoing, start blinking immediately upon receiving a request over MQTT.
- [5 pts] Properly prevent invalid inputs (e.g., out-of-range or non-numeric blink counts) from crashing the program.

Submit your code in the box below (to be graded manually):

4 Room Condition Dashboard

Recent submission on 15:59 01 Oct 2020 Result: PASSED || Manual : 0/1 (incomplete)

Current

Recent

All

Room Condition Dashboard (20 Points)

Department of Computer Engineering, KU, is measuring various conditions in the room 606. The measurements are:

Measurement	Unit	Published Topic
Temperature	degrees Celsius	ku/cpe/room606/temperature
Humidity	percent	ku/cpe/room606/humidity
Light	lux	ku/cpe/room606/light
CO ₂ concentration	ppmv	ku/cpe/room606/co2
PM2.5	ug/m3	ku/cpe/room606/pm25

All these measurements are published over the specified MQTT topics every 5 seconds to the MQTT broker running at iot.cpe.ku.ac.th.

Notes: published messages contain mocked-up measurements, not real data.

Your task

- Using your Node-RED instance at iot.cpe.ku.ac.th, create a new flow and name it **midterm**.
- In the flow, create a Node-RED dashboard with two line charts displaying temperature and humidity levels in the room 606 over time.
- Submit the dashboard's URL in the box below.

Submit