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Week 7 Studio 1

Group 4b

3rd March 2020

Question 1: Resistance of the Sensor without any bending: 29.7kΩ

Question 2: Resistance of the Sensor when it is bent: 96.6kΩ

Question 3: ADC reading when it is placed straight: 731

Voltage measured at A0: 3.61V

Question 4: ADC reading when it is bent: 895

Voltage measured at A0: 4.36V

Question 5:

Voltage at A0 is equal to the potential difference across Flex sensor. From Q3 and Q4, we can observe that when the sensor is bent, voltage at A0 increases, so the potential difference across the sensor increases.

Question 6:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Flex Sensor Flat | | Flex Sensor Bent | |  |  |
|  | ADC | Voltage/V | ADC | Voltage/V | ADC Range | Voltage Range/V |
| 1.2K | 981 | 4.89 | 1010 | 4.98 | 29 | 0.09 |
| 12K | 731 | 3.61 | 895 | 4.36 | 164 | 0.75 |
| 22K | 591 | 2.93 | 831 | 4.06 | 240 | 1.13 |
| 39K | 448 | 2.22 | 730 | 3.56 | 282 | 1.34 |

Question 7:

As the resistance value of 1.2k resistor is too small compared to the resistance of the flex sensor, it is negligible compared to the resistance of the flex sensor. Thus by potential divider principle, the ADC value is approximately equal to 1023 and voltage at A0 is approximately equal to 5V regardless of the flex sensor being bent. Hence the change on ADC value and voltage is very small regardless of the flex sensor being bent.

Question 8:

When the flex sensor is bent, “adcvalue” will change. However, “adcvalue” only affects the “\_delay\_loop\_2(adcvalue)”, and “ledToggle()” will be called again after the delay. Thus, period of LED being on and off will change but the duty cycle still remains unchanged at 50% regardless of the flex sensor being bent. Hence, the potential difference across LED remains unchanged. Since the brightness of LED is directly proportional to potential difference across it, the brightness remains unchanged.

Question 9: Highest frequency: 2.18kHz

Lowest frequency: 1.52kHz

Question 10:

A screenshot of a cell phone

Description automatically generated

Question 11: Highest frequency: 3.57Hz

Lowest frequency: 2.24Hz

Question 12:

The highest frequency of the signal applied to LED using interrupt is higher than the highest frequency of the signal applied to LED using polling. The lowest frequency of the signal applied to LED using interrupt is higher than the lowest frequency of the signal applied to LED using polling. This is because polling uses extra time for continuous comparison to check whether conversion is completed or not while interrupt does not. Hence period of the signal for polling will be longer, leading to lower frequency.

Question 13:

A screenshot of text

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