



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023**

- COURSE NAME : INTERNET OF THINGS (IOT)
- COURSE CODE : BIW 33803
- PROGRAMME CODE : BIW
- EXAMINATION DATE : JULY/AUGUST 2023
- DURATION : 3 HOURS
- INSTRUCTIONS : 1. ANSWER ALL QUESTIONS.
2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**.
3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK.

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

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Q1 Based on the given case study, answer **Q1(a)-Q1(d)**.

A logistics company wants to implement a technology system that can track their fleet of vehicles in real-time. They plan to install tracking devices in each vehicle, which will be connected to a central system that will allow them to monitor vehicle location, speed, and fuel consumption. The company hopes that this technology will help them improve efficiency, reduce costs, and improve customer service.

- (a) Analyse how the IoT - based system can improve the logistics company's efficiency, reduce costs, and improve customer service. (5 marks)

- (b) List the suitable sensors for the system and explain why each sensor is necessary? (6 marks)

- (c) Discuss **TWO (2)** advantages and **TWO (2)** disadvantages of using a cellular network versus a Wi-Fi network for the communication between the tracking devices and the central system. (4 marks)

- (d) Discuss the privacy and security concerns that the logistics company should consider when implementing the IoT based system. (5 marks)

- Q2**
- (a) Describe the limitations of IPv4 in terms of supporting the IoT and how IPv6 addresses these limitations. (5 marks)

 - (b) Explain the importance of power management for IoT devices. (5 marks)

 - (c) What is sensor response time and why is it important in IoT-based projects? (4 marks)

 - (d) Explain the role of General-Purpose Input/Output (GPIO) pins in IoT boards. Provide examples of how these pins can be programmed and controlled using a programming language such as C-Arduino. (6 marks)

- Q3** (a) Explain the importance of IoT protocol architecture in ensuring IoT security, and provide examples of secure IoT protocols. (6 marks)
- (b) What are the basic requirements for programming an Arduino device, and how do they differ from other programming environments? (5 marks)
- (c) The following **Figure Q3 (a)** shows a C-Arduino program intended to control two LEDs with two pushbuttons. However, one of the LEDs doesn't seem to be responding to the pushbutton. Identify the error and correct the program so that both LEDs respond to their respective pushbuttons.

```
int ledPin1 = 10;
int ledPin2 = 11;
int buttonPin1 = 2;
int buttonPin2 = 3;

void setup() {
  pinMode(ledPin1, INPUT);
  pinMode(ledPin2, OUTPUT);
  pinMode(buttonPin1, OUTPUT);
  pinMode(buttonPin2, INPUT);
}

void loop() {

  if (digitalRead(buttonPin1) == LOW) {
    digitalWrite(ledPin1, HIGH);
  } else {
    digitalWrite(ledPin1, LOW);
  }

  if (digitalRead(buttonPin2) == LOW)
  {
    digitalWrite(ledPin2, HIGH);
  }

  else {
    digitalWrite(ledPin1, LOW);
  }
}
```

Figure Q3 (a)

(4 marks)

Q4 Based on the circuit given in **Figure Q4** answer Q4(a)-Q4(e).

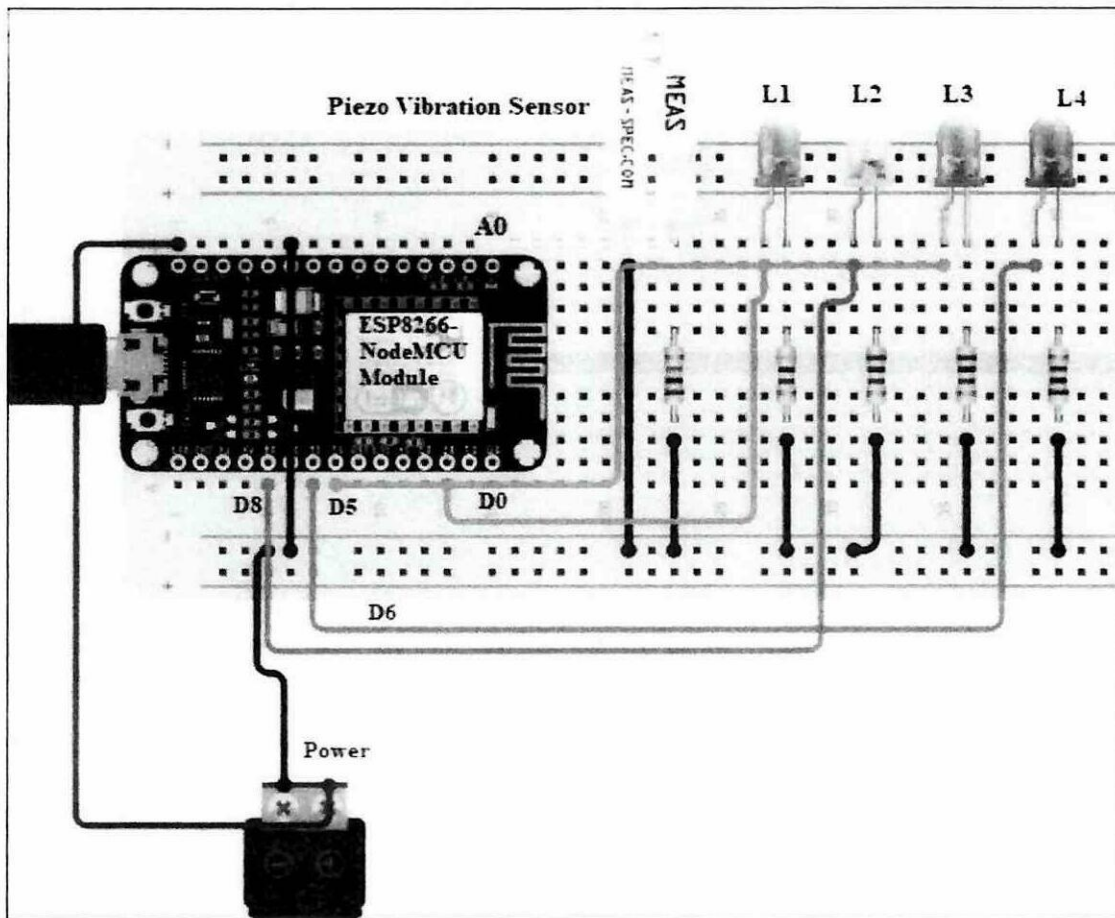


Figure Q4

Table Q4

Vibration Level	Status
<100	NORMAL , Turn ON LED Number 1 (L1)
100-150	MINOR VIBRATION , Turn ON LED Number 2 (L2)
150-200	MODERATE VIBRATION , Turn ON LED Number 3 (L3)
>200	HIGH VIBRATION , Turn ON LED Number 4 (L4)

- (a) Write a C-Arduino code segment to define the input and output pins for the Piezo Vibration Sensor and all LEDs. (5 marks)

- (c) Write a C-Arduino code segment to read the vibration level from the sensor and display the corresponding status on the LED as in **Table Q4**. (8 marks)

- (d) Write a complete C-Arduino code to send the value of vibration sensor to IoT ThingSpeak cloud platform. Using the following information: Wireless network name=" BIWIoT", Password =" yourname@2023", Channel ID = "8105174" and WRITEAPIKEY =" DD0IW9AVW5Y8GWYK". (8 marks)

- (e) Do you think it is possible to add another vibration sensor to the given circuit? Give reasons for your answer. (4 marks)

Q5 Based on the given scenario, answer **Q5(a)-Q5(c)**.

Assume that the given data in **Table Q5** has been read by the temperature and humidity sensors. According to the sensor specifications: the sensor measuring ranges of temperature and humidity sensors are between [-12,110] and [0,100] respectively.

Table Q5

Temperature (°C)	28.65	128.85	28.95	29.67	-30.04	29.28	28.98	29.72	26.94	129.47
Humidity (%)	59.64	59.48	59.17	159.01	59.06	80.54	58.54	158.7	58.72	58.22

- (a) Explain the importance of ensuring data quality in IoT applications. (6 marks)

- (b) Describe the common sources of error in sensor data and provide an example of each. (6 marks)

- (c) Write a complete C-Arduino code to detect out-of-range fault data during data collection, based on the given scenario. (8 marks)

-END OF QUESTIONS-

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