Question 1 Multiple Choice

a. When powering an LED, a series resistor must be carefully chosen so that:

iv. You do not overdraw current

b. Why do we call Mark Weiser's The Computer for the 21st Century a seminal paper?

i. It has impacted so many other research fields

iii. It defined the field Ubiquitous/Pervasive Computing

c. With respect to the basic structure for IoT, please select statement(s) that are correct.

ii. Connections between IoT objects are part of the network.

iv. Edge computing creates a distributed system.

Question 2 Evaluation

You have developed a mobile app that displays the step count of users using a wearable sensor.

a. Write an abstract task.

Determine step count using the app

b. Write two concrete tasks.

- Determine the number of steps walked in the past hour
- Determine the number of steps walked in the past day
- Determine the number of steps walked in the past week
- Determine the number of steps walked in the past month

Question 3 Interfaces

Consider the interface available in a Virtual Reality Environment.

a. Which interaction style best describes this interface?

Exploring

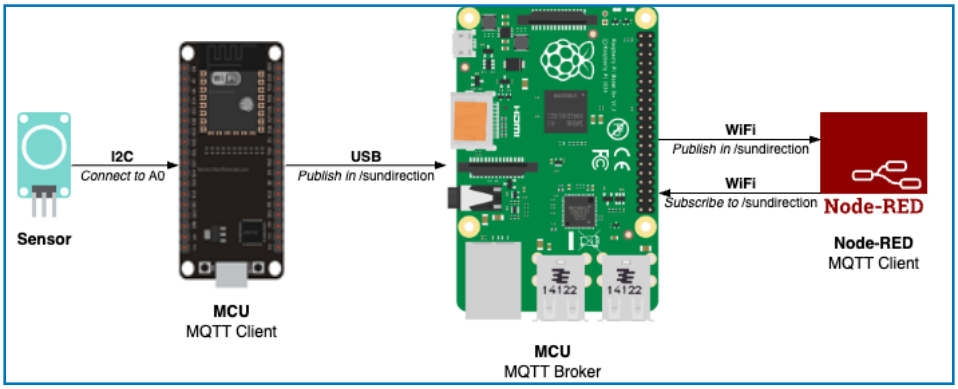
b. Briefly explain why it describes it the best.

It involves a user moving through a virtual space, similar to how we explore physical spaces.

Question 4 Pervasive Application

A simple pervasive system is needed to measure the direction of the sun to control a solar panel.

a. Draw a block diagram of how the four (4) components of the system are interconnected.



b. Write an Arduino program for the micro-controllers that read the sun direction from the sensor and post them to a topic in the MQTT broker.

```
#include <WiFi.h>
#include <MQTT.h>

IPAddress mqttHost(172, 23, 31, 4);
WiFiClient wifiNet;
MQTTClient mqttClient;

// WiFi settings
const char ssid[] = "solarWiFi";
const char pass[] = "soalar2023";

void messageReceived(String &topic, String &payload);

unsigned long lastTime = 0;
int outReadingInt;
char outReadingStr[5];
int inReadingInt;

void setup() {
  Serial.begin(115200);
  analogReadResolution(8);
  pinMode(A0, INPUT);

  Serial.println("Connecting to WiFi: ");
  Serial.println(ssid);
  WiFi.begin(ssid, pass);

  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
  }
  Serial.println(WiFi.localIP());

  mqttClient.begin(mqttHost, 1888, wifiNet);
  while (!mqttClient.connect("esp32-mqttClient")) {
    delay(500);
  }
  Serial.println("\nMQTT connected!\n");
  mqttClient.subscribe("/sundirection");
}

void loop() {
  mqttClient.loop();
  outReadingInt = analogRead(A0);
  outReadingInt = map(outReadingInt, 0, 1023, 0, 180);
  itoa(outReadingInt, outReadingStr, 5);
  // Publish a message roughly every 10 seconds
  if (millis() - lastTime > 10000) {
    lastTime = millis();
    mqttClient.publish("/sundirection", outReadingStr);
  }
}
```

c. Sketch a Node-RED flow for the above application.