1 Choice Questions

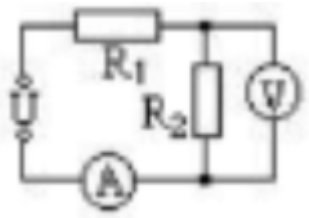
1.1 What is the main function of flux used during the soldering process on PCBs?
A) To cool down the components quickly
B) To strengthen the mechanical bonding
C) To increase the melting point of solder
D) To clean metal surfaces and prevent oxidation

1.2 When you need to measure the light intensity in the environment and record the data using Arduino, which sensor should you choose?
A) Photodiode
B) Photoresistor
C) Optocoupler
D) Photovoltaic cell

1.3 What is a typical property of micro-controllers regarding their memory capacity?

A) They have extensive RAM and ROM
B) They have minimal RAM and extensive ROM
C) They typically contain gigabytes of RAM
D) They support dynamic loading of programs extensively

1.4 Figure shows a circuit, U=24 volts, the total resistance is 1.25 times the resistance of R2, and the total resistance is 12 ohms. The resistance of R1 is:



A) 8 Ω
B) 6 Ω
C) 5 Ω
D) 10 Ω

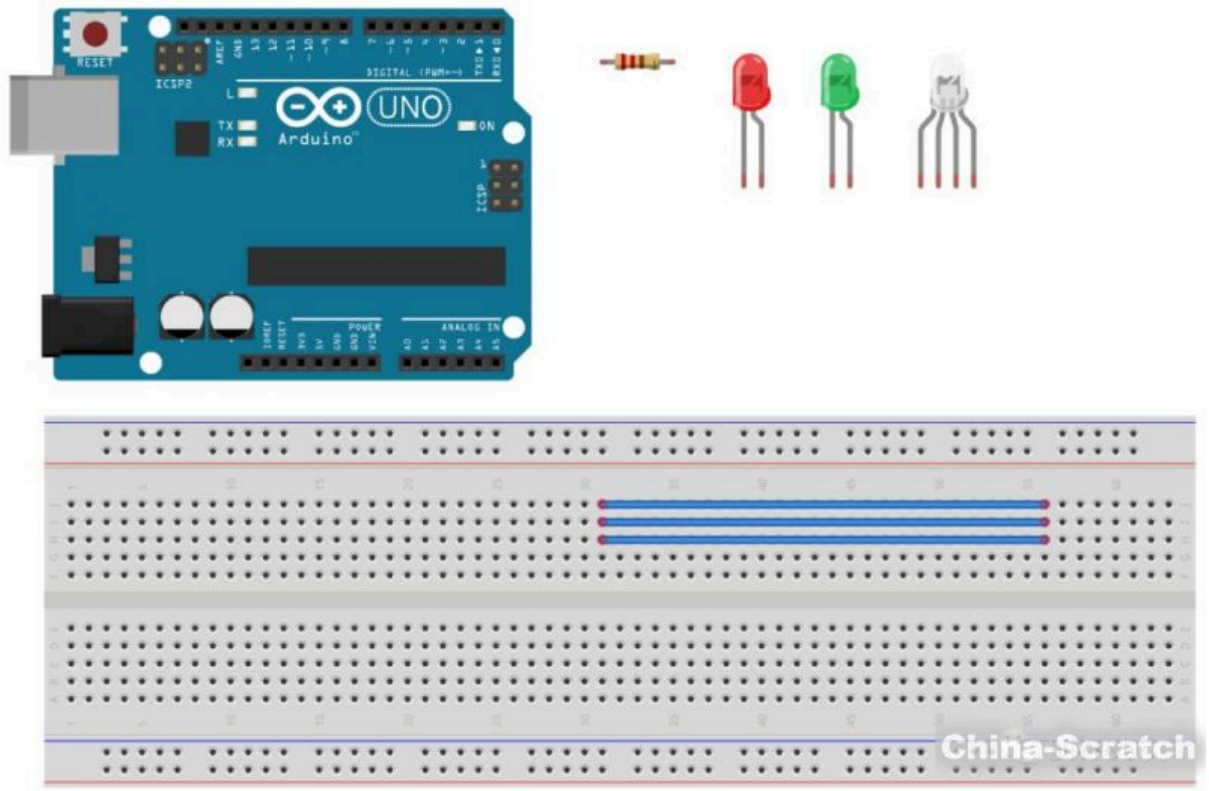
1.5 Which of the following is an example of a regression task in machine learning?

A) Predicting the price of a house based on its features
B) Identifying if an email is spam or not
C) Sorting images based on the presence of a particular object
D) Clustering customers based on purchasing behavior

2 Long Answer Questions

2.1 The Ecobee thermostat incorporates various sensors and gadgets to enhance household energy efficiency and user comfort. Describe in detail the types of sensors integrated into the Ecobee thermostat. Discuss their specific roles and how they contribute to the functionality of the thermostat. Additionally, evaluate how these sensors interact with other gadgets within the Ecobee ecosystem, such as the Ecobee SmartCamera and SmartSensor, and the impact of these interactions on user experience and energy management.

2.2 Using the Arduino Uno, a breadboard, one 220 ohm resistor, red and green LEDs, and jumper wires as shown in the image, design a program that performs the following tasks:



1. **Setup:** Configure the red and green LEDs to be controlled by digital output pins on the Arduino. Use the 220 ohm resistor to limit the current to the red LED. The green LED should blink three times when the Arduino is reset before maintaining a steady state.
2. **Loop Behavior**:

- The red LED should turn on for 1 second and then turn off for 1 second in a continuous loop.
- The green LED should be initially off and only turn on when the red LED is off.

3. **Additional Task**:

- Write code that allows the Arduino to switch the green LED on for 5 seconds whenever a condition you specify (like a certain number of loops) is met.

Answers:
1.1 D
1.2 B
1.3 B
1.4 D
1.5 A

2.1 The Ecobee thermostat utilizes advanced sensors to optimize home climate control efficiently. Key sensors include temperature sensors for monitoring and adjusting indoor temperatures, occupancy sensors to detect room usage and save energy, humidity sensors for comfort and health, and proximity sensors that activate the thermostat’s display when approached.

These sensors enable the Ecobee to adapt heating and cooling based on real-time occupancy and environmental data, promoting energy savings. Integration with Ecobee's SmartSensors and SmartCamera extends these capabilities, allowing for more precise adjustments across different rooms and adding security features through occupancy detection via the camera.

This smart integration enhances user experience by maintaining comfort while minimizing energy use, significantly reducing the home's carbon footprint. Overall,

the Ecobee's sensor technology and its ecosystem interaction demonstrate a significant step forward in creating efficient, responsive smart home systems.

2.2

```
const int redLED = 8;
const int greenLED = 9;

void setup() {
  pinMode(redLED, OUTPUT);
  pinMode(greenLED, OUTPUT);

  for (int i = 0; i < 3; i++) {
    digitalWrite(greenLED, HIGH);
    delay(500); // On for 500 milliseconds
    digitalWrite(greenLED, LOW);
    delay(500); // Off for 500 milliseconds
  }
}

void loop() {
  digitalWrite(redLED, HIGH); // Turn red LED on
  digitalWrite(greenLED, LOW); // Ensure green LED is off
  delay(1000); // Red LED on for 1 second

  digitalWrite(redLED, LOW); // Turn red LED off
  digitalWrite(greenLED, HIGH); // Turn green LED on
  delay(1000); // Both off for 1 second

  static int cycleCount = 0;
  cycleCount++;
  if (cycleCount == 10) {
    digitalWrite(greenLED, HIGH);
    delay(5000); // Green LED on for 5 seconds
    cycleCount = 0; // Reset cycle counter
  }
}
```