

Q1. Discuss different types of temperature sensors available.

Ans. Types of sensors include:-

1. Thermocouples:-

- These sensors measure voltage changes to determine temperature.
- They are often used in industrial settings, such as in furnaces, kilns and boilers.

2. Resistance temperature detectors (RTDs):-

- These sensors measure temperature by correlating the resistance of the RTD element with temperature.
- RTDs are considered the most accurate and stable temperature sensors.

3. Thermistors:-

- These sensors are sensitive to small temperature variations.
- They have high resistance at low temperatures, which decreases as the temperature rises.

4. Non-contact sensors:-

- These sensors detect changes in physical environmental conditions without ~~by~~ physical contact with the measured object.

5. Infrared sensors:-

- These sensors sense a variety of characteristics in their surroundings.

Q2. What is the working principle of DHT11 sensor

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including capturing moisture and temperature?

Ans.

→ Working principle:-

- The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor.
- It uses a capacity humidity sensor and thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no ~~analog~~ analog input pins needed).
- It is fairly simple to use, but requires careful timing to grab data.
- You can get new data from it once every 2 seconds, so when using the library from Adafruit, sensor readings can be up to 2 seconds old.
- Comes with a 4.7K or 10K resistor, which you will want to use as a pullup from the data pin to VCC.

→ Specifications:

- Temperature: 0-50°C with $\pm 2^\circ\text{C}$ accuracy
- Moisture: 20-80% with $\pm 5\%$ accuracy
- When the temperature or humidity changes, the sensor's resistance or capacitance changes, which causes a change in the electrical signal.
- The sensor then converts this change into a digital signal that can be read by a microcontroller.

Q3. Is the DHT11 waterproof?

Ans. • The DHT11 provides temperature measurements in Celsius and communicates with the microcontroller

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via the I2C bus protocol.

- It is covered with a plastic housing so it can be immersed into the water and has a 3m long cable to that flexibility to the entire construction.

Q4. What's the sampling rate of a DHT11 sensor?

Ans The sampling rate of a DHT11 sensor is no more than 1 Hz sampling rate (once every second).

Q5. What is the significance of Adafruit library in this assignment?

Ans The significance of Adafruit library in this assignment:

1. User-friendly library

- Adafruit offers well-documented libraries for various programming environments (like Arduino), which simplify the process of reading data from the DHT11 sensor.

2. Quality hardware:

- Adafruit is known for its high quality components
- The DHT11 sensor offered by Adafruit is typically reliable and well tested.

3. Open-source philosophy:

- Adafruit embraces open-source principles, allowing users to modify and adapt the provided libraries and code to suit their specific needs.

4. Simplified data acquisition:

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- The library provides straightforward functions to read temperature and humidity data from the DHT11 sensor, allowing users to easily acquire sensor readings without needing to handle low-level code.

5. Data formatting:

- The library formats the output data (temperature and humidity) in a user-friendly way, making it easier to use in further calculations or display.