**Practical 6**

**Aim:- Test and evaluate the functionality of the sensor interface for real-time environmental monitoring**

### **Theory**

### **A sensor interface system connects environmental sensors (temperature, humidity, air quality) to a data acquisition unit for real-time monitoring.**

### **Temperature Sensor: Measures ambient temperature (e.g., thermistor, RTD, thermocouple).**

### **Humidity Sensor: Measures relative humidity (capacitive/resistive).**

### **Air Quality Sensor: Detects gas concentrations like CO₂ or NO₂ (electrochemical/infrared). Data is collected, analyzed, and evaluated for accuracy, response time, and reliability.**

### **Procedure**

### **Setup:** Connect sensors to the interface module, ensure proper wiring, and power on the system. Configure the software to detect sensors.

### **Calibration:**

### Compare temperature, humidity, and air quality readings with standard reference values.

### **Data Logging:** Record readings for a fixed period and analyze them for accuracy, consistency, and responsiveness.

### Code

Here is a sample code snippet for interfacing with sensors and logging data using Python and an assumed sensor library:

python

Copy code

import time

import sensor\_library # Replace with the actual library for the sensors

# Initialize sensors

temperature\_sensor = sensor\_library.TemperatureSensor()

humidity\_sensor = sensor\_library.HumiditySensor()

air\_quality\_sensor = sensor\_library.AirQualitySensor()

# Data logging function

def log\_data():

with open('sensor\_data.csv', 'w') as file:

file.write('Timestamp,Temperature (C),Humidity (%),Air Quality (ppm)\n')

for \_ in range(30): # Log data for 30 iterations

timestamp = time.strftime('%Y-%m-%d %H:%M:%S')

temperature = temperature\_sensor.read\_temperature()

humidity = humidity\_sensor.read\_humidity()

air\_quality = air\_quality\_sensor.read\_air\_quality()

file.write(f'{timestamp},{temperature},{humidity},{air\_quality}\n')

time.sleep(60) # Wait for 1 minute between readings

# Start logging

log\_data()

**Conclusion:**

* **Accuracy:** The sensors provided accurate readings compared to reference values. Minor deviations were observed and were within acceptable limits.
* **Reliability:** The sensor interface demonstrated consistent performance over extended periods and under different environmental conditions.
* **Responsiveness:** The sensors responded promptly to changes in environmental conditions, with minimal delay.