Network Communication and Network Programming

Objective:

This task is designed to test your **understanding of networking protocols** and your **ability to implement them in Python**.
You will complete both **conceptual questions** and **practical coding exercises**.

Part 1 – Open-Ended Questions

Answer the following:

1. What are the main differences between **HTTP, MQTT, and CoAP**?

2. Which protocol would you choose for:
   - Sending temperature data every second
   - Controlling a smart bulb (on/off)
   - Uploading a large file

3. Explain **QoS levels (0, 1, 2)** in MQTT and give one use case for each.

4. Why does CoAP use **UDP** instead of TCP?

5. Why is **HTTP** still widely used even though MQTT and CoAP are lighter for IoT?

Part 2 – Practical Projects (Python)

You will write three small programs using Python.

A. HTTP

- Build a **Flask server** that responds to:
  - `GET` → returns temperature value.
  - `POST` → updates temperature value.
- Write a **client program** using the `requests` library to test both methods.

B. MQTT

- Use the **Paho MQTT** library.
- Create a **publisher** that sends random temperature values every 2 seconds.
- Create a **subscriber** that listens to the topic and prints the received values.

C. CoAP

- Use the **aiocoap** library.
- Create a **server** with a resource `/temperature` that returns a text value.
- Write a **client** that sends a `GET` request and prints the result.

Deliverables

1. Written answers for **Part 1**.
2. Python code files for **Part 2**.
3. Screenshots or console outputs showing your programs working.
4. A short **comparison table** (HTTP vs MQTT vs CoAP).

Rules & Restrictions

- This is an **individual task**
- **Using AI tools (ChatGPT, Copilot, Gemini, etc.) to generate code is strictly forbidden.**
- You must **write the code yourself**. Any AI-generated code will result in **zero marks**.
- You can use **official documentation**.