Basic of Network (CoAP, MQTT) and Cloud (ThingSpeak).

1. Constrained Application Protocol (CoAP)

- **Definition**: CoAP is a web transfer protocol for constrained nodes and networks in IoT.
- **Designed For**: Low-power, low-bandwidth devices.
- **Based On**: RESTful architecture, similar to HTTP but optimized for UDP.
- **Features**:
    - Uses UDP instead of TCP.
    - Supports asynchronous message exchanges.
    - Message types: Confirmable, Non-confirmable, Acknowledgment, Reset.
    - Methods: GET, POST, PUT, DELETE.
    - Lightweight and low overhead.
- **Use Case**: Ideal for sensor networks and low-power wireless communication.

2. Message Queuing Telemetry Transport (MQTT)

- **Definition**: MQTT is a lightweight publish-subscribe messaging protocol.
- **Designed For**: Devices with limited resources or unreliable networks.
- **Core Concepts**:
    - **Broker**: Central server that routes messages.
    - **Clients**: Devices that publish or subscribe to topics.
    - **Topics**: Channels through which messages are passed.
- **QoS Levels**:

    - 0 – At most once (fire and forget)
    - 1 – At least once (acknowledged delivery)
    - 2 – Exactly once (guaranteed delivery)
- **Use Case**: Home automation, industrial monitoring, real-time messaging.

3. ThingSpeak Cloud Platform

- **Definition**: ThingSpeak is an open-source IoT platform for data collection, storage, analysis, and visualization.
- **Features**:
    - Real-time data logging.
    - Integration with MATLAB for analytics.
    - RESTful API support for data posting and retrieval.
    - Supports MQTT and HTTP protocols.
- **Components**:
    - **Channels**: Store data from devices.
    - **Fields**: Represent different sensor readings.
    - **Charts**: Visualize data in graphs.
- **Use Case**: Remote sensor monitoring, data analysis, alert systems.