**IoT-Based Sensor Nodes for Structural Health Monitoring of Bridges**

(i) Sensors used:

- Accelerometers (ADXL345)

- Strain Gauges (Vishay CEA-06-125UN-350)

- Inclinometers (SCA100T-D01)

(ii) Controller used:

- ESP32 Microcontroller (dual-core, Wi-Fi, and Bluetooth capabilities)

(iii) IDE used:

- Arduino IDE (for programming and testing the ESP32 microcontroller)

(iv) Cloud platform used:

- ThingSpeak IoT Cloud Platform (for data visualization, analysis, and storage)

Now, here are 3 questions based on the reference with discussions:

Q1: How do the ESP32 microcontrollers enable IoT capabilities in the sensor nodes?

Discussion: The ESP32 microcontrollers provide Wi-Fi and Bluetooth connectivity, allowing the sensor nodes to transmit data to the cloud platform in real-time. Their dual-core architecture enables efficient data processing and handling.

Q2: What benefits does the ThingSpeak IoT Cloud Platform offer for data management and analysis in the SHM system?

Discussion: ThingSpeak enables real-time data visualization, storage, and analysis. It supports data processing, filtering, and alert generation, facilitating proactive maintenance and reducing downtime.

Q3: How do the IoT-based sensor nodes improve structural health monitoring of bridges compared to traditional methods?

Discussion: The IoT-based sensor nodes offer real-time monitoring, improved accuracy, and enhanced decision-making capabilities. They enable early detection of potential issues, reducing maintenance costs and improving bridge safety.

Citation:

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