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Computer Science and Engineering
B. Tech. VIII^th Semester

CS442
Wireless Sensor Network

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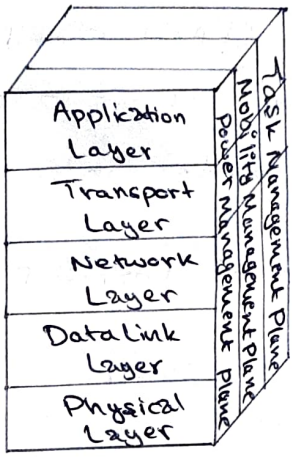
Q.1. Explain in detail the communication architecture of sensor networks.

→ 1. Layered Network Architecture:



It is a type of communication architecture for wireless sensor networks that follows the OSI model. It consists of five layers: application, transport, network, datalink and physical layer. It also has three cross layers: power management, mobility management and task management.

In layered network architecture, sensor nodes are organised into concentric layers around a single powerful base station. The base station collects data from sensor nodes using one-hop or multi-hop communication.

Advantages of Layered Network Architecture:

i) This architecture is simple and scalable.

ii) Less power consumption as compared to other Sensor Network Architecture because each node participates only in short-distance, low power transmissions to nodes of the neighbouring nodes.

iii) Higher fault tolerance.

The disadvantage of using Layered Network Architecture is that it may cause congestion near the base station.

2. Clustered Network Architecture:

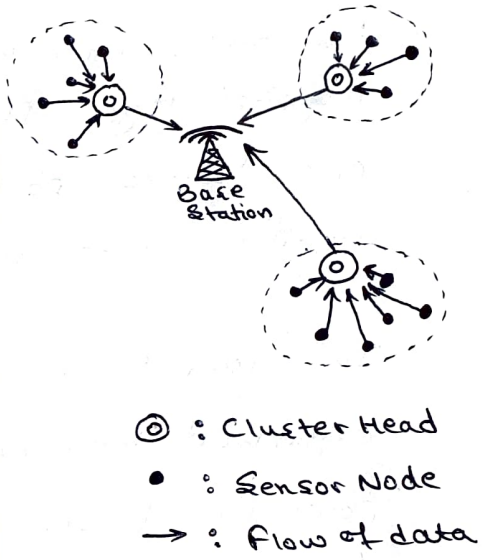
It is another type of communication architecture for wireless sensor networks that is based on the LEACH protocol. LEACH stands for Low Energy Adaptive Clustering Hierarchy. It is a distributed algorithm for organising sensor nodes into groups called clusters.

Properties of Leach Protocol:

i) It is a 2-tier hierarchy clustering architecture.

ii) It is a distributed algorithm for organising the sensor nodes into groups called clusters.

iii) The cluster head nodes in each of the autonomously formed clusters create the Time-division Multiple Access (TDMA) schedules.



iv) It makes use of the concept called Data fusion which makes it energy efficient.

In clustered network architecture, sensor nodes autonomously form clusters and elect cluster heads. Cluster heads collect data from cluster members and aggregate them before sending them to the base station. Cluster heads rotate periodically to balance energy consumption among sensor nodes. This architecture improves energy efficiency and scalability but requires complex coordination and synchronisation among sensor nodes.

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Q02. Describe about various types of digital modulation encoding techniques. (aka. Digital-to-Analog Signal Conversion)

→ Digital modulation encoding techniques are methods of changing a carrier signal to represent digital data. They use discrete modulation levels to produce different signal characteristics such as amplitude, frequency or phase.

Some common digital modulation encoding techniques:

(i) Amplitude-shift keying (ASK): The amplitude of the carrier signal is changed according to the binary data. ASK is simple but susceptible to noise interference.

(ii) Frequency-shift Keying (FSK): The frequence of the carrier signal is changed according to the binary data. FSK is more robust than ASK but requires more bandwidth.

(iii) Phase-shift Keying (PSK): The phase of the carrier signal is changed according to the binary data. PSK is more efficient than ASK and FSK but requires more complex receivers.

There are also variations and combinations of these techniques, such as quadrature amplitude modulation (QAM), which uses both amplitude and phase changes.