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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: VII - THEORY EXAMINATION (2025 - 2026)

Subject: Wireless Sensor Network

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

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1. Attempt all parts:-

- 1-a. The key characteristic of wireless communication is (CO1, K1) 1
- (a) Limited coverage area
- (b) High security
- (c) Dependence on physical cables
- (d) Mobility and flexibility
- 1-b. The primary difference between ultraviolet (UV) rays and infrared (IR) rays in the electromagnetic spectrum is (CO1,K1) 1
- (a) UV rays have higher frequency than IR rays
- (b) UV rays have shorter wavelength than IR rays
- (c) IR rays have higher energy than UV rays
- (d) IR rays have longer wavelength than UV rays
- 1-c. The primary purpose of a sensor node in a wireless sensor network is (CO2, K2) 1
- (a) To process data received from the sink node
- (b) To connect multiple devices in a network
- (c) To sense the environment, process data, and communicate wirelessly
- (d) To amplify the wireless signal strength
- 1-d. The network architecture commonly used in wireless sensor networks for efficient data collection is (CO2, K1) 1
- (a) Hierarchical architecture
- (b) Mesh architecture
- (c) Star architecture
- (d) Bus architecture

- 1-e. The standard that defines the IEEE 802.15.4 MAC protocol for low-rate wireless personal area networks is (CO3, K1) 1
- (a) IEEE 802.11
 - (b) IEEE 802.15.4
 - (c) IEEE 802.16
 - (d) IEEE 802.22
- 1-f. A common challenge in designing routing protocols for mobile ad hoc networks (MANETs) is (CO3, K2) 1
- (a) Predictable node mobility
 - (b) Static network topology
 - (c) Reliable and stable links
 - (d) Dynamic network topology and link failures
- 1-g. The Minimum Spanning Tree (MST) algorithm aim to achieve in topology control (CO4, K1) 1
- (a) Maximizes the number of edges in the network
 - (b) Minimizes the number of nodes in the network
 - (c) Connects all nodes with the minimum total edge weight
 - (d) Separates the network into multiple disconnected components
- 1-h. The role of cluster members in a clustered wireless sensor network is (CO4, K1) 1
- (a) They form multiple clusters in the network
 - (b) They forward data directly to the sink node
 - (c) They communicate with cluster heads and send their data
 - (d) They perform time synchronization for the entire network
- 1-i. The following components is typically found in a smart home automation system using wireless sensor networks (CO5,K2) 1
- (a) Water pump
 - (b) Air conditioner
 - (c) Car engine
 - (d) Centralized control unit
- 1-j. The purpose of deploying multiple sensor nodes for target detection and tracking is (CO5, K1) 1
- (a) Reducing network complexity
 - (b) Increasing redundancy and improving accuracy
 - (c) Decreasing data transmission speed
 - (d) Saving energy
2. Attempt all parts:-
- 2.a. Define fault tolerance in wireless sensor networks. (CO1, K1) 2
- 2.b. List two advantages of using Bluetooth (BT) nodes in sensor network applications. (CO2, K1) 2
- 2.c. Write the primary design goal of the IEEE 802.15.4 MAC protocol. (CO3, K1) 2
- 2.d. Write two key components required for infrastructure establishment in sensor 2

- networks. (CO4, K1)
- 2.e. Write the name of primary communication protocol used in WSN for home control applications. (CO5, K1) 2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i) Identify two advantages of using wireless sensor networks over wired sensor networks. Briefly explain how these advantages contribute to the effectiveness of WSNs in different applications. (CO1, K2) 6

3.a.(ii) Explain the challenges associated with channel noise in wireless communication. (CO1, K1) 6

3.b. Answer any one of the following:-

3.b.(i) Explain the significance of power management in sensor node architecture. (CO2, K2) 6

3.b.(ii) Describe the significance of network architecture in the context of wireless sensor networks. (CO2, K2) 6

3.c. Answer any one of the following:-

3.c.(i) Describe the basic principle of flooding routing protocols. (CO3, K2) 6

3.c.(ii) Discuss the advantages of IEEE 802.15.4 MAC protocol in low-power, low-data-rate applications. (CO3, K2) 6

3.d. Answer any one of the following:-

3.d.(i) Describe the role of base stations in infrastructure establishment in wireless sensor networks.(CO4,K3) 6

3.d.(ii) Discuss the importance of localization and positioning in wireless sensor networks. (CO4, K3) 6

3.e. Answer any one of the following:-

3.e.(i) Describe the various challenges faced in integrating WSN into home control systems. (CO5, K3) 6

3.e.(ii) Explain reconfigurable sensor networks and their importance. (CO5, K2) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Define a wireless sensor network (WSN) and explain its basic components. Explain how do sensors, actuators, and communication modules collaborate in a typical WSN architecture? (CO1, K2) 10

4-b. Discuss the challenges associated with data security and privacy in wireless sensor networks. Explain how can sensitive data be protected from unauthorized access and malicious attacks in WSNs, considering the resource-constrained nature of sensor nodes? (CO1, K2) 10

5. Answer any one of the following:-

5-a. Discuss the impact of communication protocols on sensor node architecture. Explain how do different communication protocols affect the energy consumption, data transmission speed, and reliability of sensor nodes in a wireless sensor network? (CO2,K3) 10

- 5-b. Compare and contrast the key features and specifications of IRIS, Mica Mote, and EYES nodes. Describe the unique advantages of each sensor node in specific applications. (CO2, K2) 10
6. Answer any one of the following:-
- 6-a. Discuss the classification of MAC protocols in wireless sensor networks based on their operation and synchronization mechanisms. (CO3, K3) 10
- 6-b. Explain the concept of location discovery in wireless sensor networks and its importance in MAC protocol design. (CO3, K3) 10
7. Answer any one of the following:-
- 7-a. Discuss the importance of time synchronization in wireless sensor networks. Explain how is time synchronization achieved, and various challenges associated with it?(CO4,K3) 10
- 7-b. Discuss the importance of open-source node-level software platforms in the development of wireless sensor network applications. (CO4, K3) 10
8. Answer any one of the following:-
- 8-a. Describe the various factors that influence the selection of sensor nodes for effective field sampling in environmental monitoring applications. (CO5, K3) 10
- 8-b. Describe the key technical specifications and features of the IEEE 802.15.4 LR-WPANs standard. Explain how do these specifications address the specific requirements of wireless sensor networks in various applications? (CO5, K3) 10