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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 (2024 - 2025)

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 20

1. Attempt all parts:-

1-a. The commonly used wireless communication technology for short-range communication is (CO1, K1)_ 1

(a) Bluetooth

(b) Satellite communication

(c) Fiber optics

(d) Ethernet

1-b. The work of transmitter in the wireless communication is (CO1, K1) 1

(a) Receives incoming signals

(b) Modulates the signal for transmission

(c) Demodulates received signals

(d) Amplifies the signal strength

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 following is not a typical hardware component of a sensor node (CO2, K2) 1

(a) Antenna

(b) Camera

(c) Power source
(d) Microcontroller

1-e. The primary design goal of the IEEE 802.15.4 MAC protocol is (CO3, K2) 1

(a) High data rate communication
(b) Low energy consumption and low complexity
(c) Long communication range
(d) Support for multimedia streaming

1-f. The primary objective of the Traffic-adaptive medium access protocol (TRAMA) in wireless networks is (CO3, K2) 1

(a) To maximize energy consumption
(b) To minimize data accuracy
(c) To adaptively adjust contention window sizes based on network traffic
(d) To increase collision rates

1-g. The primary purpose of clustering in wireless sensor networks is (CO4, K3) 1

(a) To increase data accuracy
(b) To minimize energy consumption
(c) To maximize node density
(d) To enhance transmission range

1-h. Time synchronization is important in wireless sensor networks (CO4, K2) 1

(a) To increase energy consumption
(b) To ensure nodes wake up and sleep at different times
(c) To enable accurate data fusion and coordination
(d) To decrease network scalability

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. In medical applications, what can wireless sensor networks be used for in hospitals? (CO5, K2) 1

(a) Controlling room temperatures
(b) Managing cafeteria menus
(c) Broadcasting television channels
(d) Monitoring patients' vital signs

2. Attempt all parts:-

2.a. Define channel capacity in a wireless communication system. (CO1,K1) 2

2.b. List the various hardware components used for designing a sensor node 2

	architecture.(CO2,K2)	
2.c.	What is the primary goal of location discovery in wireless sensor networks?(CO3,K2)	2
2.d.	Write two common types of network topologies used in wireless sensor networks.(CO4,K2)	2
2.e.	In industrial automation, what types of data can WSN sensors collect and transmit?(CO5,K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	List three key characteristics of wireless sensor networks. Explain how these characteristics differentiate WSNs from traditional wired networks.(CO1,K3)	6
3-b.	Discuss the various advantages, disadvantages of data aggregation in wireless sensor networks.(CO1,K3)	6
3-c.	Discuss the differences between IRIS and Mica mote.(CO2,K3)	6
3-d.	What are the various optimization goals for a wireless sensor network? Explain any one of them.(CO2,K3)	6
3.e.	What distinguishes IEEE 802.15.4 MAC protocol from other MAC protocols in terms of its focus and applications?(CO3,K3)	6
3.f.	Describe the role of base stations in infrastructure establishment in wireless sensor networks.(CO4,K3)	6
3.g.	How does reconfigurability enhance adaptability in changing environments?(CO5,K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Draw the basic block diagram of a communication system and explain the function of each block. (CO1,K1)	10
4-b.	Describe the different regions of the electromagnetic spectrum and their applications in wireless communication technologies.(CO1,K2)	10

5. Answer any one of the following:-

5-a.	Explain the importance of network architecture in the context of sensor nodes. Discuss the trade-offs between centralized and decentralized architectures and their implications on scalability, fault tolerance, and data processing efficiency.(CO2,K2)	10
5-b.	Discuss the implications of network topology on data reliability and latency in wireless sensor networks. Compare star, mesh, and cluster-based topologies, highlighting their advantages and disadvantages in different sensor network scenarios.(CO2,K2)	10

6. Answer any one of the following:-

6-a.	Describe the design goals of MAC protocols in wireless sensor networks. Discuss the trade-offs involved in achieving energy efficiency, low latency, and high	10

throughput. Provide examples of protocols that emphasize each of these goals.(CO3,K3)

6-b. Discuss how BMAC achieves energy efficiency, reliability, and adaptability in dynamic network environments. Describe its mechanisms for collision avoidance and energy conservation. (CO3,K2) 10

7. Answer any one of the following:-

7-a. Discuss the importance of time synchronization in wireless sensor networks. How is time synchronization achieved, and what are the challenges associated with it?(CO4,K3) 10

7-b. Explain how energy-efficient localization algorithms can be designed to minimize energy usage while ensuring accurate node positioning.(CO4,K2) 10

8. Answer any one of the following:-

8-a. Discuss the impact of reconfigurable sensor networks on healthcare applications, such as patient monitoring and telemedicine.(CO5,K3) 10

8-b. Examine the use of WSN in water and gas leakage detection systems for homes.(CO5,K4) 10