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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.

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SECTION-A 20

1. Attempt all parts:-

1-a. The challenge in wireless communication due to the nature of radio waves is (CO1, K1) 1

(a) Low data transfer rate

(b) Limited bandwidth

(c) High security risk

(d) Unidirectional communication

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 function of a sensor node in a wireless sensor network? (CO2,K1) 1

(a) To process data and store it permanently

(b) To sense the environment, process data, and communicate wirelessly

(c) To provide power to other devices in the network

(d) To amplify communication signals

1-d. The following best describes the range of BT nodes in wireless sensor networks is (CO2,K1) 1

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(a) Several kilometers
(b) Hundreds of meters
(c) A few centimeters
(d) Unlimited range

1-e. SMAC stand for in the context of wireless sensor networks (CO3,K2) 1

(a) Sensor Media Access Control
(b) Synchronized Medium Access Control
(c) Secure MAC
(d) Simple Media Access Control

1-f. The primary criterion used to classify routing protocols into different categories is (CO3,K2) 1

(a) Network size
(b) Routing algorithm
(c) Topology information usage
(d) Data transmission rate

1-g. The primary purpose of localization in wireless sensor networks is (CO4,K2) 1

(a) To conserve energy in sensors
(b) To determine the geographical location of sensor nodes
(c) To enhance data transmission speed
(d) To increase the processing power of sensor nodes

1-h. The following is a purpose of node-level simulators in wireless sensor networks (CO4,K2) 1

(a) Physical deployment of sensor nodes
(b) Simulation of individual sensor node behavior and interactions
(c) Creation of network topologies
(d) Manufacturing sensor nodes

1-i. The following is a common application of wireless sensor networks in home control systems (CO5,K1) 1

(a) Traffic management
(b) Industrial automation
(c) Smart home automation
(d) Agricultural monitoring

1-j. In industrial automation, what role do wireless sensor networks play in monitoring equipment? (CO5,K2) 1

(a) They increase the equipment speed
(b) They allow real-time monitoring and control of machinery
(c) They decrease the equipment's lifespan
(d) They reduce the need for maintenance

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2. Attempt all parts:-

2.a.	Write the range of frequency band for Wi - Fi. (CO1,K1)	2
2.b.	Which programming languages are commonly used for developing applications on IRIS nodes? (CO2,K2)	2
2.c.	What is the key difference between table-driven and on-demand routing protocols in wireless sensor networks? (CO3,K2)	2
2.d.	Write the name of one technology commonly used for indoor positioning in sensor networks.(CO4,K1)	2
2.e.	What is the impact of environmental factors on target detection and tracking accuracy in WSN? (CO5,K1)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Discuss the concept of multipath fading in wireless channels (CO1,K3)	6
3-b.	List three key characteristics of wireless sensor networks. Explain how these characteristics differentiate WSNs from traditional wired networks.(CO1,K3)	6
3-c.	Explore the role of microcontrollers and microprocessors in sensor node architectures. (CO2,K2)	6
3-d.	Discuss the types of sensors used and communication requirements for an environmental monitoring sensor network scenario. (CO2,K2)	6
3.e.	Why is energy efficiency a critical concern in designing MAC protocols for wireless networks? (CO3,K2)	6
3.f.	Describe the role of base stations in infrastructure establishment in wireless sensor networks.(CO4,K3)	6
3.g.	What challenges are faced in deploying wireless sensor networks for environmental monitoring in remote areas?	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Explain the concept of modulation in wireless communication. How does modulation enable the transmission of digital data over analog channels? (CO1,K1)	10
4-b.	Describe the various characteristics of a wireless channel. (CO1,K2)	10

5. Answer any one of the following:-

5-a.	Discuss the impact of communication protocols on sensor node architecture. 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.	Discuss the challenges and limitations associated with deploying IRIS, Mica Mote, and EYES nodes in large-scale sensor networks. What factors should be considered when scaling up the deployment of these nodes for extensive coverage and data collection?(CO2,K3)	10

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6. Answer any one of the following:-

6-a.	Describe the various advantages, limitations and applications of the SMAC protocol.(CO3,K2)	10
6-b.	Describe the issues related to network congestion, redundant transmissions, and excessive control overhead in flooding routing protocol.(CO3,K3)	10

7. Answer any one of the following:-

7-a.	Discuss the various techniques used for topology control in wireless networks.(CO4,K2)	10
7-b.	Discuss the features and advantages of any node-level simulator.(CO4,K2)	10

8. Answer any one of the following:-

8-a.	Discuss the challenges associated with reconfiguring sensor nodes in real-time. (CO5,K3)	10
8-b.	How do wireless sensor networks facilitate real-time target tracking and localization?(CO5,K2)	10

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