SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY

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Puttur -517583, Tirupati District, A.P. (India)

25 years of EXCELLENCE

DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

Year & Sem.: **IV B. Tech – I Semester –R23**

Subject & code: **23EC0439 WIRELESS SENSOR NETWORKS**
(Professional Elective -V)
UNIT I-OVERVIEW OF WIRELESS SENSOR NETWORKS

Q.No	Question	Marks
1.a	Define Wireless Sensor Networks.	[L1][CO1][2M]
1.b	List the major hardware components of a sensor node.	[L1][CO1][2M]
1.c	What is meant by fault tolerance in wireless sensor networks?	[L1][CO1][2M]
1.d	List any two types of sensors used in environmental WSN applications	[L1][CO1][2M]
1.e	Name any four types of wireless sensor networks.	[L1][CO1][2M]
2.a	Explain the evolution and need for Wireless Sensor Networks.	[L2][CO1][5M]
2.b	Explain the functions of the sensing unit and processing unit in a sensor node.	[L2][CO1][5M]
3	Explain the architecture of a wireless sensor node with a neat diagram.	[L2][CO1][10M]
4.a	Write short notes on the communication unit of WSN.	[L2][CO1][5M]
4.b	Explain the role of the power unit in wireless sensor networks.	[L2][CO2][5M]
5	Discuss the fundamental network characteristics of Wireless Sensor Networks.	[L2][CO1][10M]
6.a	Discuss the importance of MEMS technology in WSNs.	[L2][CO1][5M]
6.b	Explain the unique constraints and challenges in Wireless Sensor Networks.	[L2][CO6][5M]
7	Describe enabling technologies for WSNs and their significance.	[L2][CO1][10M]
8.a	Discuss challenges caused by limited memory and processing power.	[L2][CO2][5M]
8.b	Explain the security challenges in wireless sensor networks.	[L2][CO2][5M]
9.a	Explain the concept of scalability in WSNs.	[L2][CO2][5M]
9.b	Differentiate between terrestrial WSN and underwater WSN.	[L2][CO6][5M]
10.a	Explain the concept of Quality of Service (QoS) requirements in Wireless Sensor Networks.	[L2][CO2][5M]
10.b	Explain the applications of mobile wireless sensor networks.	[L2][CO6][5M]
11. a	Compare and contrast homogeneous and heterogeneous wireless sensor networks with suitable examples.	[L2][CO1][5M]
11. b	Explain the concept of self-organization and its importance in wireless sensor networks.	[L2][CO1][5M]

UNIT II-ARCHITECTURE

Q.No	Question	Marks
1.a	Define design Principles in Wireless Sensor Networks.	[L1][CO2][2M]
1.b	What is the role of a Base Station in a Wireless Sensor Network?	[L1][CO2][2M]
1.c	Define Network Lifetime in Wireless Sensor Networks.	[L1][CO2][2M]
1.d	What is meant by Network Throughput?	[L1][CO2][2M]
1.e	What is meant by **Latency** in Wireless Sensor Networks?	[L1][CO2][2M]
2.a	Explain the basic features of Wireless Sensor Network architecture.	[L2][CO2][5M]
2.b	Explain flat and hierarchical architectures in WSN.	[L2][CO2][5M]
3	Explain data aggregation, in-network processing, and cross-layer design in WSNs	[L3][CO2][10M]
4.a	Write short notes on physical layer in Wireless Sensor Network.	[L2][CO2][5M]
4.b	Explain transceiver design considerations in WSN.	[L2][CO2][5M]
5	Discuss sensor network scenarios and design principles.	[L4][CO2][10M]
6.a	Discuss optimization goals in Wireless Sensor Networks.	[L2][CO2][5M]
6.b	Explain Figures of Merit used to evaluate Wireless Sensor Networks.	[L2][CO2][5M]
7	Explain the Gateway concept in WSN and discuss its significance in network architecture.	[L4][CO2][10M]
8.a	Explain energy efficiency challenges in Wireless Sensor Networks.	[L3][CO2][5M]
8.b	Explain reliability as an optimization goal in WSN architecture.	[L3][CO2][5M]
9.a	Explain the objectives of network architecture design in Wireless Sensor Networks.	[L2][CO2][5M]
9.b	Explain scalability as a Figure of Merit in WSN architecture	[L2][CO2][5M]
10.a	Explain the importance of Packet Delivery Ratio (PDR) as a performance metric in Wireless Sensor Networks.	[L3][CO2][5M]
10.b	Explain the impact of Node Mobility, Sink Mobility, and Event Mobility on WSN architectural design.	[L3][CO2][5M]
11.a	Discuss centralized and distributed network architectures in WSN, highlighting their advantages and limitations.	[L4][CO2][5M]
11.b	Explain single-hop and multi-hop communication architectures in wireless sensor networks.	[L3][CO2][5M]

UNIT III-NETWORKING SENSORS

Q.No	Question	Marks
1.a	Define MAC Protocol in Wireless Sensor Networks.	[L1][CO3][2M]
1.b	Define Duty Cycle in Wireless Sensor Networks.	[L1][CO3][2M]
1.c	State the purpose of IEEE 802.15.4 standard.	[L1][CO3][2M]
1.d	Define Wakeup Radio concept.	[L1][CO3][2M]
1.e	What is Geographic Routing?	[L1][CO3][2M]
2	Explain design goals, challenges, and requirements of MAC protocols.	[L4][CO3][10M]
3.a	Explain Low Duty Cycle Protocols and their importance.	[L3][CO3][5M]
3.b	Explain the working principle of S-MAC protocol.	[L3][CO3][5M]
4.a	Explain the sleep-listen scheduling in S-MAC.	[L3][CO3][5M]
4.b	Explain adaptive listening in S-MAC.	[L3][CO3][5M]
5	Explain B-MAC protocol and Low Power Listening (LPL).	[L4][CO3][10M]
6.a	Explain features/frame structure of IEEE 802.15.4.	[L3][CO3][5M]
6.b	Explain ZigBee architecture and network topologies.	[L3][CO3][5M]
7	Explain IEEE 802.15.4, ZigBee stack and applications.	[L4][CO3][10M]
8.a	Explain Mediation Device Protocol in heterogeneous WSNs.	[L3][CO3][5M]
8.b	Explain Wakeup Radio concepts vs conventional duty-cycle.	[L3][CO3][5M]
9.a	Explain Address and Name Management in WSNs.	[L3][CO3][5M]
9.b	Explain the assignment of MAC addresses in WSNs.	[L3][CO3][5M]
10.a	Explain Energy-Efficient Routing protocols in WSNs.	[L4][CO3][5M]
10.b	Compare Energy-Efficient Routing and Geographic Routing.	[L4][CO3][5M]
11.a	Explain the hidden terminal and exposed terminal problems in wireless sensor MAC protocols and how they affect network performance.	[L3][CO3][5M]
11.b	Explain the classification of routing protocols used in wireless sensor networks.	[L2][CO3][5M]

UNIT IV- INFRASTRUCTURE ESTABLISHMENT

Q.No	Question	Marks
1.a	Define hop stretch factor in topology control.	[L1][CO4][2M]
1.b	State the primary objective of the LEACH protocol.	[L1][CO4][2M]
1.c	Distinguish between internal and external time synchronization.	[L2][CO4][2M]
1.d	Define trilateration.	[L1][CO4][2M]
1.e	Define clock drift in wireless sensor networks.	[L1][CO4][2M]
2	Explain FTSP, including time stamping, delay management.	[L4][CO4][10M]
3.a	Explain centralized and decentralized synchronization in LTS.	[L3][CO4][5M]
3.b	Explain RBS operation and error reduction mechanism.	[L3][CO4][5M]
4.a	Explain Time-Diffusion Synchronization.	[L3][CO4][5M]
4.b	Compare TOA and TDOA localization techniques.	[L4][CO4][5M]
5.a	Explain DV-Hop localization scheme.	[L3][CO4][5M]
5.b	Explain APIT localization scheme.	[L3][CO4][5M]
6	Explain topology discovery and response approaches.	[L4][CO4][10M]
7.a	Explain mathematical formulation for position estimation.	[L3][CO4][5M]
7.b	Explain Multi-Sequence Positioning.	[L3][CO4][5M]
8.a	Explain iterative and collaborative multilateration.	[L3][CO4][5M]
8.b	Explain lighthouse approach for distance estimation.	[L3][CO4][5M]
9.a	Explain cone-based topology control.	[L3][CO4][5M]
9.b	Explain cluster-head selection heuristics.	[L3][CO4][5M]
10.a	Explain Information-Driven Sensor Querying (IDSQ) and Sensor Tasking in Wireless Sensor Networks	[L3][CO4][5M]
10.b	Explain passive clustering vs self-pruning.	[L4][CO4][5M]
11.a	Analyze efficiency/privacy trade-offs in localization.	[L4][CO6][5M]
11.b	Explain graph-reduction strategies.	[L3][CO4][5M]

UNIT V- SENSOR NETWORK PLATFORMS AND TOOLS

Q.No	Question	Marks
1.a	State the purpose of SRAM and Flash memory in a sensor node.	[L1][CO5][2M]
1.b	List hardware components of Berkeley Mica mote.	[L1][CO5][2M]
1.c	Define split-phase programming in TinyOS.	[L1][CO5][2M]
1.d	State purpose of node-level simulators.	[L1][CO5][2M]
1.e	Distinguish node-centric and data-centric programming.	[L2][CO5][2M]
2	Explain how the processor, radio, and memory interact in a Berkeley Sensor Mote	[L4][CO5][10M]
3.a	Compare RAM, ROM, EEPROM, and Flash.	[L4][CO5][5M]
3.b	Compare microcontrollers and DSPs.	[L4][CO5][5M]
4.a	**Compare the features of TOSSIM and NS-2 for node-level simulation in WSNs.**	[L4][CO5][5M]
4.b	Explain Smart Dust concept.	[L3][CO5][5M]
5.a	Analyze programming challenges due to constraints.	[L4][CO6][5M]
5.b	**Explain the architecture of Contiki OS and the concept of Protothreads.**	[L3][CO5][5M]
6	Discuss simulation tools and required models.	[L4][CO5][10M]
7.a	Explain abstract regions, macroprogramming, state-centric programming.	[L3][CO5][5M]
7.b	Explain Tiny DB distributed database model.	[L3][CO5][5M]
8.a	Explain Active Messages model.	[L3][CO5][5M]
8.b	Compare specialized sensor platforms and Berkeley motes.	[L4][CO5][5M]
9.a	Explain WINS platform architecture.	[L3][CO5][5M]
9.b	Explain role of micro OS in power management.	[L3][CO5][5M]
10.a	Analyze impact of size, power, and environmental constraints.	[L4][CO6][5M]
10.b	Explain Sensor Network Management Protocol.	[L3][CO5][5M]
11.a	Compare thread-based and event-based operating systems.	[L4][CO5][5M]
11.b	Analyze dynamic reprogramming significance/challenges.	[L4][CO6][5M]