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**MTECH**  
**(SEM I) THEORY EXAMINATION 2025-26**  
**SENSOR NETWORK**

TIME: 3 HRS

M.MARKS: 70

**Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

1. Attempt *all* questions in brief.

2 x 7 = 14

Q no.	Question
a.	Explain the evolution of Wireless Sensor Networks from traditional distributed systems.
b.	Why can conventional software engineering models not be directly applied to WSNs?
c.	How do energy efficiency and latency requirements influence protocol design?
d.	Compare schedule-based MAC protocols and random access-based MAC protocols.
e.	Discuss the major routing challenges in wireless sensor networks.
f.	How do sensor application data models influence routing strategies?
g.	Explain the functioning of traditional transport protocols TCP and UDP.

**SECTION B**

2. Attempt any *three* of the following:

7x3=21

a.	Describe the nature of data generated in sensor networks. How do data characteristics influence storage, aggregation, and communication strategies?
b.	Describe the working of the S-MAC protocol in detail. Explain periodic listen and sleep operations and how schedule synchronization is achieved.
c.	Describe flooding and its variants as routing techniques. Why is naive flooding inefficient, and how do improved variants address these issues?
d.	Analyze the feasibility of using TCP or UDP in wireless sensor networks. What modifications or alternatives are required to make them suitable?
e.	Explain the need for network management in wireless sensor networks. What unique requirements distinguish WSN management from traditional networks?

**SECTION C**

3. Attempt any *one* part of the following:

7x1=7

a.	Provide an overview of IEEE 802.15.4 and ZigBee. Compare their roles in WSNs and explain how they support low-power and low-data-rate communication.
b.	Analyze the future demands on sensor-based software. What challenges arise due to scalability, heterogeneity, and long-term unattended deployment?

4. Attempt any *one* part of the following:

7x1=7

a.	Analyze adaptive listening in S-MAC. How does it improve throughput while maintaining energy efficiency?
b.	Compare B-MAC, T-MAC, and X-MAC with respect to duty cycling, contention handling, and energy consumption. In which scenarios is each protocol most suitable?



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**5. Attempt any *one* part of the following: 7x1=7**

a.	Explain the working principles of Low-Energy Adaptive Clustering Hierarchy. How does clustering help in energy conservation?
b.	Discuss Directed Diffusion and Geographical Routing. Compare their data-centric and location-based approaches to routing.

**6. Attempt any *one* part of the following: 7x1=7**

a.	Compare TinyOS, Mate, and MagnetOS. Highlight their differences in abstraction level, programmability, and system support.
b.	Explain the architecture and working of TinyOS. How does its event-driven model support energy-efficient operation?

**7. Attempt any *one* part of the following: 7x1=7**

a.	Discuss issues related to naming and localization in sensor networks. Illustrate your answer with a real-world sensor network application case study.
b.	Explain the MANNA architecture for sensor network management. How does it address monitoring, configuration, and adaptation?

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