

(2½ Hours)

[Total Marks: 75]

- Instructions:** (1) All questions are compulsory.
(2) Make suitable assumptions wherever necessary and state the assumptions made.
(3) Numbers to the right indicate marks.
(4) Draw neat labelled diagrams wherever necessary.

1 : Attempt the following questions(Any 4)

20 Marks

- What are the important features and advantages of using TinyOS in embedded systems and wireless sensor networks?
- Explain the concept of mobile ad-hoc networks (MANETs) and illustrate their structure with a clear diagram?
- How is the network architecture of Wireless Sensor Networks (WSNs) structured? Explain the different components involved?
- What are the primary objectives when optimizing a Wireless Sensor Network, and how do they impact performance?
- Why are gateways considered essential in the functioning of Wireless Sensor Networks? How do they facilitate communication?
- What are the major issues and challenges encountered when designing and deploying sensor networks, and how do they affect their efficiency?

2 : Attempt the following questions(Any 4)

20 Marks

- How do routing strategies operate in Wireless Sensor Networks, and what are the different approaches to optimize data transmission?
- Explain the SPIN (Sensor Protocols for Information via Negotiation) protocol and its role in sensor networks?
- How does the process of congestion detection and avoidance function in wireless sensor networks to maintain efficient communication?
- What is the Low Energy Adaptive Clustering Hierarchy (LEACH) protocol, and what are its strengths and weaknesses in WSNs?
- Describe the transport control protocols specifically designed for Wireless Sensor Networks?
- How does the Power-efficient gathering in Sensor Information System (PEGASIS) routing protocol work, and what benefits does it provide in sensor networks?

3 : Attempt the following questions(Any 4)

20 Marks

- a. What distinguishes GEO, LEO, and MEO satellite orbits, and how do they differ in terms of coverage and functionality?
- b. What are the key characteristics and features of the DECT (Digital Enhanced Cordless Telecommunications) system?
- c. In what ways is satellite communication used and what are some of its major applications?
- d. What benefits do cellular systems offer, particularly in terms of network performance and user experience?
- e. How does signal propagation work with different types of antennas, and how do these antenna types affect the transmission of signals?
- f. Explain the system architecture of UMTS (Universal Mobile Telecommunications System) with a detailed diagram, highlighting its key components and functions?

4 : Attempt the following questions(Any 5)

15 Marks

- a. Provide a brief overview of the security services offered by GSM and their role in ensuring communication privacy and integrity.
 - b. Explain the terms : a) Spread Spectrum and b) TETRA technologies.
 - c. What are the main components of the Sensor MAC (Medium Access Control) protocol, and how do they contribute to the efficient operation of wireless sensor networks?
 - d. What are the differences between single-hop and multi-hop networks, and how do each of these network types impact data transmission and network efficiency?
 - e. What are important functions of transceivers in wireless communication systems, and how do they contribute to the overall network performance?
 - f. What defines an ad-hoc network? Describe its characteristics, and discuss the challenges it faces, especially in the context of Wireless Sensor Networks (WSNs)?
-