Reg. No.															

Question Paper Code	13993

M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Third Semester

M.E. - Embedded Systems Technologies

24PESEL309 - EMBEDDED WIRELESS SENSOR NETWORKS

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which of the following is a major challenge in wireless sensor networks? (a) High bandwidth (b) Energy constraint (c) Large packet size (d) Centralized routing	1	K1	CO1
2.	The EYES and MICAZ motes are examples of (a) Smart sensors (b) Sensor nodes (c) Gateways (d) Transceivers	1	K1	CO1
3.	Figure of Merit in WSN design is used to: (a) Evaluate node placement (b) Measure performance efficiency (c) Identify hardware types (d) Select antenna type	1	K1	CO2
4.	The gateway in a WSN primarily functions as (a) Sensor node (b) Energy harvester (c) Bridge to external network (d) Local controller	1	K1	CO2
5.	Which protocol minimizes power consumption by using sleep/wake scheduling? (a) LEACH (b) CSMA/CA (c) TDMA (d) AODV	1	K1	CO3
6.	IEEE 802.15.4 standard is used for: (a) Long-range communication (b) MAC and PHY layers in WSN (c) Data encryption (d) Error correction	1	K1	CO3
7.	Smart sensors differ from conventional ones mainly by (a) Size (b) Shape (c) Inbuilt intelligence and signal conditioning (d) Material	1	K1	CO4
8.	A humidity sensor belongs to which sensor category? (a) Chemical (b) Optical (c) Environmental (d) Magnetic	1	K1	CO4
9.	LEACH protocol is primarily used for (a) Routing in clustered WSNs (b) Encryption (c) Error correction (d) MAC scheduling	1	K1	CO5
10.	FPGA-based architectures in WSN are preferred for: (a) Low cost (b) Customizability and event-driven operation (c) Slow processing (d) High power consumption	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Explain why energy efficiency is critical in Wireless Sensor Networks.	2	K2	CO1
12.	Write short notes on EYES.	2	K1	CO1
13.	Define optimization goals in WSN design. Give examples.	2	K1	CO2
14.	State and explain any two design principles for WSN architecture.	2	K1	CO2
15.	State any two design considerations for transceivers used in WSNs.	2	K1	CO3
16.	What is meant by low duty cycle protocols?	2	K1	CO3
17.	Explain the role of signal-conditioning circuits in smart sensors.	2	K2	CO4
18.	What are the advantages of using smart sensors over conventional ones?	2	K1	CO4
19.	Write short notes on wildfire and habitat monitoring applications.	2	K1	CO5
20.	Mention the benefits of embedding cryptographic algorithms in WSN nodes.	2	K1	CO5

21.	Briefly explain the importance of energy management in WSNs.		2	K1	CO2
22.	Write short notes on embedded C programming for sensor nodes.		2	K1	CO5

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	(i)	Explain in detail the challenges and characteristics requirements of Wireless Sensor Networks.	6	K2	CO1
		(ii)	Compare mobile ad-hoc networks and sensor networks.	5	K2	CO1
			OR			
	b)	(i)	Discuss the hardware architecture and components of a sensor node with neat sketch.	6	K2	CO1
		(ii)	Explain energy consumption in sensor nodes with examples.	5	K2	CO1
24.	a)		Explain in detail the design principles and optimization goals of Wireless Sensor Networks.	11	K2	CO2
			OR			
	b)		Describe various WSN scenarios and explain the concept of gateway architecture.	11	K2	CO2
25.	a)		Explain physical layer design considerations in WSNs and discuss wireless channel fundamentals.	11	K2	CO3
			OR			
	b)		Discuss in detail the fundamentals of MAC protocols and IEEE 802.15.4 MAC protocol.	11	K2	CO3
26.	a)		Explain the architecture and working of smart sensors with a neat diagram.	11	K2	CO4
			OR			
	b)		Describe the construction and working of humidity, soil moisture, and temperature sensors.	11	K2	CO4
27.	a)		Discuss the applications of Wireless Sensor Networks in civil, medical and environmental fields.	11	K2	CO5
			OR			
	b)		Explain embedding of LEACH and cryptographic algorithms on ARM7TDMI microcontroller using embedded C.	11	K2	CO5
28.	a)		Explain the role of FPGA-based customizable event-driven architecture in WSN implementation.	11	K2	CO5
			OR			
	b)		Write short notes on the integration of embedded software and hardware for efficient WSN design.	11	K2	CO5