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Question Paper Code: U6401

B.E. / B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

Professional Elective

Electronics and Communication Engineering

21ECV301- ADVANCED WIRELESS SENSOR NETWORKS

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Briefly describe how WSNs can be used in disaster management. CO1-U
2. Identify computing techniques that enhance decision-making in smart sensor systems. CO1-U
3. What are the key properties of localization and positioning procedures in WSNs? CO1-U
4. Give the differences in locating sensor nodes in single-layer and multi-layer networks? CO1-U
5. State the principle behind location-based routing protocols in WSNs? CO1-U
6. How do data-centric routing protocols differ from other routing protocols in WSNs? CO1-U
7. How does dynamic clustering enhance the performance of large-scale IoT-enabled sensor networks? CO1-U
8. How do machine learning-based clustering techniques optimize network partitioning in advanced WSNs? CO1-U
9. How do deep learning algorithms assist in the predictive maintenance and monitoring of smart sensor networks? CO1-U
10. What is the significance of CoAP in WSN-IoT integration? CO1-U

PART – B (5 x 16= 80 Marks)

11. (a) Discuss the unique constraints and challenges faced by wireless sensor networks. How do these factors impact the design and implementation of WSNs? CO1-U (16)

Or

- (b) Explain the architecture of a typical sensor node in a WSN. How do these components interact to ensure efficient data sensing, processing, and communication? CO1-U (16)
12. (a) Analyze the use of cloud-assisted localization in large-scale WSNs. How does it support scalability and improve overall network performance? CO6-Ana (16)
- Or
- (b) Explore the challenges of localization in multi-hop networks. CO6-Ana (16)
13. (a) Analyze the energy-efficient routing techniques in WSNs. Compare the performance of different energy-efficient protocols with real-world case studies. CO3-Ana (16)
- Or
- (b) Examine the classification of routing protocols in WSNs, focusing on hierarchical, location-based, and data-centric protocols. How do these classifications affect energy consumption and data delivery efficiency? CO3-Ana (16)
14. (a) Outline the importance of energy-efficient clustering techniques in WSNs. Compare the energy consumption of traditional and modern clustering methods. CO1-U (16)
- Or
- (b) Explain the different topology control techniques used in WSNs. Compare adaptive and real-time topology control algorithms and their impact on energy consumption. CO1-U (16)
15. (a) How can machine learning and artificial intelligence be applied to Wireless Sensor Network programming to enhance real-time data processing and decision-making? Demonstrate their role in improving network performance, adaptability and resource optimization through practical implementation strategies CO2-App (16)
- Or
- (b) In what ways can event-driven programming models be implemented to address the challenges of real-time data processing in Wireless Sensor Networks. Apply these models to enhance system responsiveness, reduce energy consumption, and improve data handling in dynamic network environments CO2-App (16)