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Question Paper Code: U2208

M.E. DEGREE EXAMINATION, APRIL/ MAY 2025

Second Semester

Communication Systems

21PCM208- AI FOR COMMUNICATION

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

1. (a) Describe the significance of AI in communication systems with suitable examples. CO1- U (20)

Or

(b) Explain the evolution of AI and its key milestones. CO1- U (20)
2. (a) How can constraint satisfaction problems (CSP) be applied to optimize communication networks? Provide examples to illustrate their implementation. CO2-App (20)

Or

(b) Apply informed and uninformed search strategies to optimize a communication system. Provide real-world examples to demonstrate their implementation and effectiveness. Swapping of halves of the block CO2-App (20)
3. (a) Design a first-order logic (FOL) knowledge base to model an AI-driven communication system that includes: CO3- App (20)
 - Devices (e.g., Mobile, Router, Server)
 - Communication types (e.g., Wired, Wireless)
 - Data transmission rules (e.g., "A device can send data if it is connected to a network")
 - Security policies (e.g., "Only authenticated users can access private networks")

Do the following tasks:

- a) Define predicates and functions to represent the system.
- b) Write at least five FOL statements modeling the rules.
- c) Use forward chaining or backward chaining to infer whether a mobile device can send data over a secured network.

Or

- (b) Consider a wireless communication network where multiple users share bandwidth. The system must allocate bandwidth based on user priority, data load, and available spectrum. CO3- App (20)

Do the following tasks.:

- a) Formulate this as a Constraint Satisfaction Problem (CSP) by defining:

- Variables (e.g., user devices, frequency channels)
- Domains (e.g., available bandwidth)
- Constraints (e.g., "No two users in the same region can use the same frequency simultaneously")

- b) Apply backtracking search and local search to find an optimized bandwidth allocation.

- c) Explain how machine learning (e.g., reinforcement learning) can improve CSP-based resource allocation.

4. (a) Analyze how linear regression is used in signal prediction for communication systems and evaluate its effectiveness in minimizing transmission errors. CO4- Ana (20)

Or

- (b) Compare and analyze the role of logistic regression and decision trees in classification tasks within wireless communication networks. Which method provides better accuracy and why? CO4- Ana (20)

5. (a) Analyze the application of AI in the Internet of Things (IoT) and smart cities for effective communication. CO5-Ana (20)

Or

- (b) Analyze the impact of AI on the development of 6G and future wireless communication technologies, highlighting its role in network optimization, automation, and intelligent resource management. CO5-Ana (20)