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CHENNAI

Final Assessment Test(FAT) - Apr/May 2025

Programme	B.Tech.	Semester	Winter Semester 2024-25
Course Code	BCSE313L	Faculty Name	Prof. V. Sakthivel
Course Title	Fundamentals of Fog and Edge Computing	Slot	D1+TD1
		Class Nbr	CH2024250501981
Time	3 hours	Max. Marks	100

Instructions To Candidates

- Write only your registration number in the designated box on the question paper. Writing anything elsewhere on the question paper will be considered a violation.

Course Outcomes

CO1: Explore technologies behind the communication and management of fogs and edge resources.
CO2: Learn the techniques for storage and computation in fogs, edges, 5G and clouds.
CO3: Implement Internet of Everything (IoE) applications through fog computing architecture and use optimization techniques for the same.
CO4: Analyze the performance and issues of the applications developed using fog and edge architecture.

Answer all Questions (10 × 10 Marks)

01. TechMart is a leading retail corporation that uses IoT-enabled devices for inventory tracking, automated checkouts, and real-time sales analytics. Their cloud-based system is struggling with the high volume of IoT-generated data from smart shelves, RFID tags, and autonomous delivery bots, leading to latency and scalability issues.

    i) Propose a fog and edge computing architecture to enhance TechMart's cloud infrastructure. (5 Marks)

    ii) Explain how this solution improves real-time data processing, inventory management, and operational scalability. (5 Marks)

    [10] (CO1/K1)

02. NeoLogix is a fast-growing last-mile delivery company struggling with delays in real-time tracking, route optimization, and warehouse automation due to high cloud latency. As the CTO, you plan to deploy edge computing across distribution hubs to improve responsiveness.

    i) Justify why edge computing is a suitable solution for NeoLogix's latency and decision-making challenges. (5 Marks)

    ii) Identify and explain five key factors to consider when selecting an edge computing platform for NeoLogix. (5 Marks)

    [10] (CO1/K2)

03. A healthcare company, SafeCare, is developing a Petri net-based Personal Emergency Response System (PERS) using Cloud-to-Fog-to-Thing (C2F2T) architecture. The system uses a smart wearable with an emergency button to alert caregivers during medical crises.

    i) Design a Petri net model for SafeCare's PERS, showing key states and transitions. (5 Marks)

    ii) Explain the system's operation, identifying actors, states, and transition functions in the context of the wearable device. (5 Marks)

    [10] (CO2/K2)

04. AutoSafe Inc. is a tech firm developing Internet of Vehicles (IoV) solutions that monitor driver behavior (e.g., speed, braking patterns) in real-time to enhance road safety. However, users and regulators are concerned about privacy risks and data misuse.

    i) Propose a privacy-aware IoV architecture and explain how AutoSafe can ensure safety without compromising user privacy. (5 Marks)

    ii) Suggest ethical guidelines for responsible data collection and usage in AutoSafe's IoV system. (5 Marks)

    [10] (CO2/K2)

05. MediFog Health is implementing fog and edge computing to enhance remote patient monitoring and telemedicine services. However, they face challenges in data security and efficient resource allocation across distributed healthcare networks.
   i. Design a fault-tolerant architecture where fog nodes can maintain operations during internet outages. (5 marks)
   ii. Propose a solution for ensuring ethical AI diagnosis when patient data is processed across different legal jurisdictions. (5 marks)

[10] (CO3/K3)

06. SmartUrban Corp. is developing a next-gen middleware to integrate IoT systems across a smart city (traffic, utilities, surveillance). Existing solutions face interoperability gaps and ethical concerns like mass surveillance risks.
   i) Analyse how SmartUrban's middleware design goals differ from conventional systems, and illustrate its architecture. (5 Marks)
   ii) Evaluate ethical risks (privacy/security) in smart city middleware and propose mitigation strategies. (5 Marks)

[10] (CO3/K4)

07. A logistics company operates a large fleet of delivery vehicles and has adopted FogTorch, a predictive analytics platform for fog computing, to enhance efficiency and reduce costs.
   i. Assess how FogTorch can optimize delivery routes and minimize transportation expenses. (5 Marks)
   ii. Propose a predictive analytics solution using FogTorch within the company's fog computing infrastructure, outlining critical implementation steps.(5 Marks)

[10] (CO4/K5)

08. A large smart office building uses IoT sensors to monitor temperature, humidity, occupancy, and energy consumption. The facility aims to enhance energy efficiency by deploying fog and edge computing for real-time data processing.
   i.Evaluate how fog computing can help reduce operational costs and lower the building's carbon footprint using data analytics.(5 Marks)
   ii. Design an energy optimization strategy using fog and edge computing, detailing key implementation steps.(5 Marks)

[10] (CO4/K5)

09. An Industrial IoT (IIoT)-enabled MSME wants to implement fog and edge computing to enhance operational efficiency in its manufacturing plant.
   i. Create a predictive maintenance strategy using fog and edge computing to improve equipment reliability in the plant. (5 marks)
   ii. Explain how fog and edge computing can minimize downtime and operational costs in the manufacturing process. (5 marks)

[10] (CO1/K6)

10. A retail chain operating in urban and suburban areas is adopting fog and edge computing to enhance customer experiences and operational efficiency.
   i. Apply fog and edge computing to personalize shopping experiences in retail stores. (5 marks)
   ii. Analyze the key challenges in maintaining data accuracy and consistency when using distributed computing in retail environments. (5 marks)

[10] (CO2/K3)

BL-Bloom's Taxonomy Levels - (K1-Remembering,K2-Understanding,K3-Applying,K4-Analysing,K5-Evaluating,K6-Creating)

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