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Final Assessment Test (FAT) - May 2024

Programme	B.Tech.	Semester	WINTER SEMESTER 2023 - 24
Course Title	FUNDAMENTALS OF FOG AND EDGE COMPUTING	Course Code	BCSE313L
		Slot	E1+TE1
Faculty Name	Prof. KABILAN K	Class Nbr	CH2023240501883
Time	3 Hours	Max. Marks	100

General Instructions:

- Write only Register Number in the Question Paper where space is provided (right-side at the top) & do not write any other details.

Answer all questions (10 X 10 Marks = 100 Marks)

01. Under Industry 5.0, an International automobile manufacturing Industry, VeruMotors enhances the assembly line to improve productivity and maintain better relationships between workers and robots. They decided to design a Fog and Edge Computing system for gesture control industrial automation systems to meet their new Industry standard. Find the opportunities and challenges to adapt Fog and Edge Computing (5 Marks) for the automation process along with a system architecture diagram (5 Marks). **[10]**

02. Few hospitals in the city used Humanoid robots to serve the food and medicines for the Covid-19 patients. It prevents doctors and medical staff from getting infected with Covid-19. What is the possibility to extend the services of Humanoid Robots with Fog and Edge Computing architecture in this application by considering different additional actors from inside and outside hospitals? **[10]**
    i) Discuss in detail with an appropriate system architecture diagram of Fog and Edge computing. (7 Marks)
    ii) How can the cloud be utilized well to support this service? (3 Marks)

03. Develop an obstacle avoidance system for autonomous drones that can detect and avoid obstacles in real-time and provide reliable navigation and control. **[10]**
    i) Design this system with an energy consumption model for the drone along with Markov Model to explain the entire system's working procedure. (6 Marks)
    ii) Compare the performance of this system with and without C2F2T. (4 Marks)

04. SmartCityX, a forward-thinking urban development project, aims to integrate various technologies to create a smart transportation system. One key component is the implementation of Internet of Vehicle (IoV) protocol stack and architecture to enable communication between vehicles, infrastructure, and other devices. **[10]**
    i) Discuss the ethical implications of IoV technology in terms of data privacy, surveillance and cybersecurity. How can SmartCityX ensure that sensitive information transmitted over the IoV network remains secure and protected from malicious actors? (6 Marks)

ii) Anticipate potential scalability issues as SmartCityX expands its transportation infrastructure. How the chosen IoV architecture accommodate future growth in terms of the number of connected vehicles, data volume and network complexity? (4 Marks)

05. Imagine a smart city project that aims to optimize traffic management using edge and fog **[10]** computing. The city has installed sensors in traffic lights, roads and vehicles to gather real-time data on traffic flow, congestion and vehicle movements. The goal is to minimize congestion, reduce travel times and improve overall traffic efficiency.
i) Discuss various optimization algorithms that could be used to improve traffic management in the smart city project. How would you adapt these algorithms to suit the constraints and requirements of edge and fog computing environments? (6 marks)
ii) How can edge and fog computing resources be dynamically allocated to prioritize critical tasks in traffic management, such as emergency vehicle prioritization or accident detection? What factors should be considered when designing resource allocation algorithms for this purpose? (4 Marks)

06. For a smart urban health-care, it is essential to develop a middleware for seamless **[10]** interoperability. In the above scenario answer to the following questions
i) Propose alternative design goals that could potentially improve the performance or capabilities of the middleware infrastructure for managing a smart-healthcare in urban scenarios. How would these new goals address current limitations? (6 Marks)
ii) How might emerging technologies such as blockchain or edge computing be integrated into the middleware infrastructure to enhance its functionality and resilience? (4 Marks)

07. i) Explore live data analytics using machine learning algorithms with collaborative edge and **[10]** cloud processing in wireless IoT networks. (7 marks)
ii) Explain the challenges in the live data analytics using an appropriate real-time example. (3 Marks)

08. i) Recommend and depict the data storage and management system for large scale distributed **[10]** applications like the one used in Indian Railways, if they want to adapt Fog and
   Edge Computing (6 Marks)
ii) How predictive analysis can be used to ensure the passengers' safety and enhanced services? (4 Marks)

09. In the scenario of smart healthcare system which supports remote patient monitoring, explain the **[10]** following questions
i) How does the utilization of edge computing enhance patient care in remote areas? (6 Marks)
ii) What security measures should be prioritized when deploying fog and edge computing solutions in healthcare environments? (4 Marks)

10. Considering the scenario of advanced smart agriculture, discuss in detail about the below **[10** questions
i) How can fog and edge computing technologies enhance precision agriculture practices? (6 Marks)
ii) What are the potential socio-economic impacts of deploying fog and edge computing solutions in rural farming communities? (4 Marks)

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