

**VIT**

Vellore Institute of Technology

REG.NO.:

**SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - II
WINTER SEMESTER 2024-2025**

SLOT: F1+TF1

Programme Name & Branch : B.Tech & Computer Science and Engineering
Course Code and Course Name : BCSE313L - Fundamentals of Fog and Edge Computing
Faculty Name(s) : Prof. Ramanathan L/Prof. Naveenkumar J/
Prof. Badrinath N /Prof. Kauser Ahmed P/
Prof. Justin Gopinath A/Prof. Munusamy S.
Class Number(s) : VL2024250501566/01570/01577/01599/01602/06625
Date of Examination : 21/03/2025
Exam Duration : 90 minutes Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- 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.

Q. No	Question	M	CO	BL
1.	Adaptive cruise control (ACC) is an advanced driver assistance system (ADAS) that autonomously adjusts a vehicle's speed to maintain a safe distance from the vehicle ahead. Vehicles equipped with cooperative ACC can communicate with each other, sharing vital data about their speed, position, and intended maneuvers. Additionally, the system considers the presence and movement of pedestrians, ensuring safe and smooth navigation. For effective decision-making, the system also requires real-time information about traffic conditions, road closures, and accidents. a) For the given scenario, create an Internet of Vehicle (IoV) network model that illustrates various forms of communication. Use the names of resources instead of icons or symbols and represent the communications with dotted lines. (5 Marks) b) Discuss the communication technologies/protocols that enable these communications, along with their properties. (5 Marks)	10	2	4
2.	Imagine a scenario for remote patient monitoring using fog and edge computing, which continuously monitors patients with chronic conditions such as diabetes and hypertension, ensuring prompt medical intervention and minimizing hospital visits. Patients use wearable devices that monitor vital signs like blood glucose levels, blood pressure, heart rate, and oxygen saturation in real-time. The edge devices handle initial data processing, such as noise filtering and anomaly detection. The processed data is then transmitted to fog nodes for more complex analysis and quick access. Critical data is also sent to the cloud for long-term storage and further analysis. Given the system has a limited number of fog nodes with constrained computing and storage capabilities, formulate the optimization	10	3	3

**VIT**

Vellore Institute of Technology

Established in the year 1984, VIT is a leading institution in the field of higher education.

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - II
WINTER SEMESTER 2024-2025

REG.NO.:

SLOT: FI+TF1

	problem by identifying variables, domains, constraints, and multi-objective functions (atleast three objective functions must be formalised).			
3.	The application aims to enhance the safety and security of an institute by deploying a real-time video surveillance system using fog and edge computing. This enables rapid incident response and efficient video data management. High-definition IP cameras are strategically placed throughout the institute, covering entrances, hallways, classrooms, and common areas. Local edge devices are situated near camera clusters to handle video feed processing. Fog nodes are set up to aggregate and analyse data from multiple edge devices, ensuring low latency and high reliability. a) For a given application, consider the scenario where the fog layer is completely removed from a fog computing system, leaving only the cloud and end devices. What would be the likely impact of this change on system performance? (5 Marks) b) How does the given system represents the trade-off between quality attributes and quantitative metrics (Mention any five)? (5 Marks)	10	3	3
4.	a) Why is context-aware adaptive design critical for middleware in fog and edge computing, and how does it enhance the quality of service (QoS) for distributed applications? Justify your answer with an example. (5 Marks) b) Why is minimizing task disruption during execution an important design goal for fog and edge middleware, and how can anticipatory techniques help achieve this goal? Justify your answer. (5 Marks)	10	1	2
5.	The application is designed to detect and respond to potential plant diseases in agricultural fields, significantly enhancing <u>early disease detection</u>. By enabling a swift response, it aims to minimize potential crop damage and improve overall yield. High-resolution images of plant leaves and stems are captured at regular intervals by image sensors. Simultaneously, environmental sensors continuously measure temperature, humidity, and soil moisture levels. The central node then classifies detected diseases based on the analyzed image data and environmental conditions. Subsequently, farmers and agricultural experts receive notifications about the detected diseases and recommended actions. Assess and elaborate on the middleware functions required for the given application in fog and edge computing.	10	1	3
