VIT®

Vellore Institute of Technology

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Reg. No. : 5067

Final Assessment Test(FAT) - Nov/Dec 2024

Programme	**B.Tech.**	Semester	**Fall Semester 2024-25**
Course Code	**BCSE401L**	Faculty Name	**Prof. Berlin Hency V**
Course Title	**Internet of Things**	Slot	**D2+TD2**
		Class Nbr	**CH2024250100452**
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.

Course Outcomes

1. Describe layers of IoT and IoT devices used for various applications.
2. Understand the standards, protocols and communication models of IoT
3. Comprehend advanced IoT applications and technologies from the basics of IoT.
4. Understand working principles of various sensor for different IoT platforms.
5. Understand the challenges of IoT using privacy and security metrics
6. Solve real-time problems and demonstrate IoT applications in various domains using prototype models.

Section - I

Answer all Questions (6 × 15 Marks) *M - Marks

Q.No	Question	*M	CO	BL
01.	(a) Design an IoT architecture for the smart Grid Application. Discuss the key components required for the architecture, including sensors, communication methods, and Data processing. Also, explain how they contribute to the overall functionality of the Smart Grid. [9 Marks] (b) The IPv4 address of one of the hosts in a network is given as 131.15.239.11/27. Determine the network ID, broadcast ID, and the number of actual hosts for the given subnetwork. [6 Marks]	15	1	2
02.	Mr. Rohan wants to install a low-power, IoT-based smart agriculture monitoring system on his farm, but it's almost 15 km from his house. What form of communication protocol will work best in these circumstances? Justify your response with appropriate context. Explain the modulation technique with the help of a suitable block diagram and waveform used in it.	15	2	1
03.	An agricultural research organization is using sensor data collected from multiple farms to predict soil health and crop yield potential. The dataset consists of the following sample features given as (a) Soil Nutrient Levels: [4.5, 2, 3, 1.5, 5.5, 1] and (b) Moisture Content: [1.5, 8.0, 2.1, 5, 2.2, 5]. The organization wants to apply dimensionality reduction by decomposing the features into a single one. Apply a dimensionality reduction method that uses covariance analysis to reduce the features to one single representative feature.	15	3	3

04.	(a) Explain the Role of Digital Signatures in Blockchain. [6 Marks] (b) Consider a dataset of patients with the following attributes: Age, Gender, and Disease. We want to anonymize this data to ensure privacy.	15	5	3

ID	Age	Gender	Disease
1	28	Male	Flu
2	30	Male	Cold
3	27	Male	Cancer
4	28	Female	Flu
5	30	Female	Cancer
6	29	Female	Cold
7	40	Male	Heart Disease
8	42	Male	Cancer
9	41	Female	Heart Disease

(i) Apply **3-anonymity** to this dataset. [4 Marks]
(ii) Apply **2-diversity** to the dataset. [3 Marks]
(iii) Explain the drawback of l-diversity. [2 Marks]

05.	(a) How does Low-Energy Adaptive Clustering Hierarchy (LEACH) minimize energy consumption in wireless sensor networks? [6 Marks] (b) Consider an IoT sensor network where sensor node S is positioned within the vicinity of three anchor nodes: A_1, A_2, and A_3, whose positions are known. The anchor nodes are placed as follows: A_1 (0,0), A_2 (10,0), A_3 (5,8). The distances between the sensor node S and each anchor node are measured as: $d_{S,A1}=7$, $d_{S,A2}=6$, $d_{S,A3}=5$. Using the localization method for each anchor, calculate the approximate coordinates (x,y) of sensor node S. [9 Marks]	15	4	2
06.	(a) Explain the role of virtual machines and containers in IoT-based Fog computing architecture. [6 Marks] (b) Design the 3-tier architecture for Fog computing enabled Smart Parking system equipped with sensors. Explain the interaction between sensors, fog nodes, and cloud data center. [9 Marks]	15	3	2

Section - II
Answer all Questions (1 × 10 Marks)

*M - Marks

Q.No	Question	*M	CO	BL
07.	Delhi City struggling with high levels of air pollution is looking to implement a real-time air quality monitoring system as part of its Smart City initiative. The goal is to track pollution levels accurately, identify high-risk areas, and enable proactive measures to improve air quality. This data would also inform the public about real-time air quality and support city policies for better health and environmental outcomes. Design a suitable IoT-based architecture for an air pollution monitoring system. How can an IoT-based air pollution monitoring system help the Delhi city track and manage air quality levels effectively?	10	6	2

BL-Bloom's Taxonomy Levels - (1.Remembering, 2.Understanding, 3.Applying, 4.Analysing, 5.Evaluating, 6.Creating)

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