VIT®

Vellore Institute of Technology
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Reg. No. : _____

Final Assessment Test(FAT) - Nov/Dec 2024

Programme	B.Tech.	Semester	Fall Semester 2024-25
Course Code	BCSE315L	Faculty Name	Prof. Anita Christaline J
Course Title	Wearable Computing	Slot	B1+TB1
		Class Nbr	CH2024250101344
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

6. Learn about software, hardware tools, protocols and components required for Wearable Computing.
7. Understand basics of Body Sensor Networks (BSN) and its Programming Framework.
8. Gain Knowledge about Cloud assisted BSN.
9. Learn About the necessary tools required for BSN applications

Section - I
Answer all Questions (10 × 10 Marks)

*M - Marks

Q.No	Question	*M	CO	BL
01.	A popular social media app is losing user engagement and receiving feedback that the interface feels "stale"(stale means old) and difficult to navigate for new users. As a lead designer, list out the HCI principles that you would apply to improve the user engagement? Explain the specific changes you would implement in the application's design and functionality to attract both current users and new users.	10	6	1
02.	You are developing a health monitoring application using Android Wear API for elderly users to track vital signs like heart rate, activity levels, and sleep patterns. The data from the application could be used by both the users and healthcare providers, and it also generate alerts in case of abnormal readings. a. How would you design the app interface and interaction flow that would ensure ease of use for elderly users and by considering their potential limitations with technology? **(5 Marks)** b. Discuss the Android Wear API features you would use to handle real-time data streaming and alerts for abnormalities. **(5 Marks)**.	10	6	3
03.	A smart home company wants to design a BLE-enabled system where users can control lights, temperature, and appliances from their mobile devices, even without Wi-Fi. a. Discuss the challenges that you would anticipate in implementing this BLE control system in a home with multiple devices spread across the rooms? **(5 Marks)** b. Analyse the different strategies for managing multiple concurrent BLE connections, minimizing interference, and ensuring that commands are executed reliably throughout the home. **(5 Marks)**	10	7	3

		10	8	2

04. A national healthcare organization is deploying an m-health system to monitor the health of thousands of individuals with wearable devices that track vital signs, activity levels, and sleep patterns. The system must be scalable to handle large amounts of data and users simultaneously.

    a. Design the m-health system architecture to handle scalability for a large population? **(6 Marks)**

    b. Consider how would you handle data collection, cloud infrastructure, load balancing, and real-time analytics to effectively manage scalability at a large scale. **(4 Marks)**

		10	8	3

05. You are developing a BSN system for critical care units where sensor failures can have serious consequences. The system must be able to detect and compensate for faulty sensors to ensure continuous monitoring of patients' vital signs.

    a. Design a fault-tolerant architecture within the BSN programming framework to ensure reliable monitoring? **(5 Marks)**

    b. Discuss how you would detect sensor failures, implement redundancy mechanisms, and use data fusion techniques to maintain system performance and data accuracy. **(5 Marks)**

		10	6	3

06. A disaster response team deploys a SunSPOT network to monitor air quality, radiation levels, and structural stability in hazardous areas. The mobile agents need to adaptively reconfigure the SunSPOT devices based on environmental conditions and emergency priorities.

    a. Elaborate how would you build the mobile agent platform to enable real-time dynamic reconfiguration of SunSPOT nodes? **(6 Marks)**

    b. Discuss how agents would monitor the environment, detect changes, and reassign tasks or reconfigure sensors to respond to emergent needs without requiring manual intervention. **(4 Marks)**

		10	9	2

07. A healthcare system is using C-SPINE to monitor patients in an intensive care unit (ICU). The collaborative BSNs must continue functioning even if one or more sensor nodes fail, ensuring continuous and accurate health monitoring.

    a. List out the methods that you would implement for fault tolerance in the C-SPINE architecture to ensure uninterrupted patient monitoring? **(5 Marks)**

    b. Elaborate how the system could detect sensor failures, reroute data collection tasks to functioning nodes, and maintain accurate collaborative health data across the network. **(5 Marks)**

		10	8	3

08. A hospital is implementing a cloud-assisted BSN system to continuously monitor patients with chronic health conditions, both during their stay and after discharge. Patients will wear devices equipped with sensors that track vital signs, including heart rate, blood glucose levels, and blood pressure. This data is transmitted in real time to the cloud, where it is analysed for early detection of potential health issues. Physicians can access the cloud data to monitor patients and provide timely interventions when necessary.

    a. Discuss the advantages that cloud assistance offer in this BSN system compared to local data processing, based on scalability and computational capability features? **(5 Marks)**

    b. Outline the strategies could be implemented to reduce latency and guarantee that healthcare providers receive real-time data from the BSNs, especially in critical situations? **(5 marks)**

09.	A fitness tracking app using step counting and physical activity recognition is deployed in a workplace wellness program. However, the app occasionally miscounts non-step movements (e.g., desk vibrations, foot-tapping) as steps, leading to inaccuracies in activity tracking. a. Elaborate how would you design an activity recognition algorithm to filter out non-step movements without missing actual steps? **(5 marks)** b. Discuss how the algorithm could distinguish real walking from similar movements and identify patterns that accurately reflect steps in a workplace setting. **(5 marks)**	10	6	2
10.	"A fitness tracker integrates emotion recognition features that assess users' stress levels based on their physiological indicators during their workouts. The users wants to know their stress affects based on their physical performance". a. Design an emotion recognition algorithm to correlate stress levels with physical activity in fitness trackers? **(5 marks)** b. Describe how you would use physiological data to provide meaningful feedback to users about their stress management and performance optimization. **(5 marks)**	10	6	2

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

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