



# VIT

Vellore Institute of Technology  
CHENNAI

Reg. Number:

## Continuous Assessment Test (CAT) – II – OCTOBER 2024

Programme	: B.Tech (CSE)	Semester	: Fall Semester 2024-2025
Course Code & Course Title	: BCSE315L & Wearable Computing	Class Number	: CH2024250101344 CH2024250101349
Faculty	: Dr. Anita Christaline J. Dr.V. Noel Jeygar Robert	Slot	: B1+TB1
Duration	: 90 Minutes	Max. Mark	: 50 Marks

### General Instructions

- Write only your registration number on the question paper in the box provided and do not write other information.
- Use statistical tables supplied from the exam cell as necessary
- Draw figures wherever necessary
- Only non-programmable calculator without storage is permitted

### Answer all questions

Q. No	Description	Marks
1	<p>You are a senior software developer at a company specializing in healthcare wearables that monitor physiological signals. To accelerate the development process and enhance the system's modularity and flexibility, your team has chosen to utilize the SPINE (Signal Processing in Node Environment) framework. This framework supports sensor data collection, processing, and transmission within a Body Sensor Network (BSN).</p> <p>a) Suggest methods to configure the SPINE framework to acquire and preprocess physiological signals from multiple sensors? List the strategies that you would use to filter noise and extract features such as heart rate variability or acceleration patterns? (5 Marks)</p> <p>b) Detail the techniques that you would employ to minimize the amount of data transmitted between the sensors and the central node using SPINE's communication modules? (5 Marks)</p>	10
2	<p>Imagine a critical care unit where each patient is equipped with a Body Sensor Network (BSN) that monitors their vital signs continuously. This data feeds into an autonomic information system that not only records the data but also analyses it in real-time. If a patient's blood pressure starts to drop rapidly, the system could autonomously increase IV fluid administration and alert medical staff, providing timely interventions. At the same time, the system could redistribute network resources to ensure that data from other patients is not delayed or lost.</p> <p>a) Design a fail-safe mechanism for the system based on the given scenario.(6 Marks)</p>	10



	<p>b) Illustrate the potential risks or ethical concerns could arise from allowing an autonomic system to adjust medical treatments automatically, without direct human intervention? How can these risks could be mitigated? <b>(4 Marks)</b></p>	
3	<p>You are a lead developer at a company creating a distributed wearable computing system for athletes to track performance, monitor health metrics, and provide real-time feedback. To optimize communication and manage this dynamic environment, your team is using the Mobile Agent Platform for Sun SPOT (MAPS). This framework supports mobile agents, software components that can traverse network nodes to execute tasks such as data collection and processing, allowing for flexible task allocation based on network conditions and user activity.</p> <p>a) Detail different mobile agents that you would utilize to dynamically distribute and reassign tasks among the wearable devices based on real-time conditions such as battery levels and sensor availability? <b>(5 Marks)</b></p> <p>b) Elaborate the mechanisms that you would implement to handle device failures or changes in the network using the MAPS framework. <b>(5 Marks)</b></p>	10
4	<p>Consider a healthcare monitoring system that will ensure the real time data fetching for emergency care units in hospitals. However, concerns exist regarding its reliability, latency, and energy consumption. Design a novel cloud-assisted BSN architecture that addresses these concerns for the specified scenario. Discuss your design choices and how they mitigate the limitations of traditional architectures.</p>	10
5	<p>You are a lead engineer at a tech company focused on developing advanced wearable devices for health monitoring and fitness tracking. Your team is tasked with creating a Body Cloud Application that allows users to seamlessly collect, analyse, and share physiological data from various wearable sensors (such as smartwatches, fitness bands, and smart clothing) with a centralized cloud platform. This application will provide users with personalized health insights, trend analysis, and recommendations based on their unique health profiles</p> <p>a) Discuss the design principles that you apply to create a user-friendly interface that enhances user engagement and encourages healthy behaviours? <b>(6 Marks)</b></p> <p>b) Suggest measures that you would put in place to protect user data and ensure compliance with health data regulations? <b>(4 Marks)</b></p>	10

\*\*\*\*\*All the best \*\*\*\*\*