



# VIT<sup>®</sup>

Vellore Institute of Technology  
(Deemed to be University under section 3 of the UGC Act, 1956)

Reg. No. :

## Final Assessment Test (FAT) - May 2024

Programme	B.Tech.	Semester	WINTER SEMESTER 2023 - 24
Course Title	DESIGN OF SMART CITIES	Course Code	BCSE316L
Faculty Name	Prof. Gayathri R	Slot	E1+TE1
		Class Nbr	CH2023240501901
Time	3 Hours	Max. Marks	100
General Instructions:			
<ul style="list-style-type: none"><li>• Write only Register Number in the Question Paper where space is provided (right-side at the top) &amp; do not write any other details.</li></ul>			

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

01. Imagine you are a project manager for implementing a community resource-sensing initiative in a rapidly evolving smart city. The city administration aims to leverage community resource-sensing technology to address various complexities and challenges associated with urban development. The task given is to devise a comprehensive plan outlining the role of community resource sensing in the smart city's infrastructure and its potential applications in enhancing community well-being. [10]
- i) Propose specific community resource sensing technology applications in addressing urban challenges such as water conservation, energy efficiency, and green space management. (5 marks)
- ii) Discuss how each application fosters sustainable development and improves community resilience. (5 marks)
02. How can urban green areas be developed, turn large areas of concrete and asphalt into urban parks, implement new ICT and Industry 4.0/5.0 information technologies into computerized urban agglomeration management systems, and thus transform current cities into modern agglomerations developing according to the green smart city model? (10 marks) [10]
03. i) A manufacturing company produces 10,000 units of a product annually, with each unit generating 5 kg of carbon dioxide emissions during production. The company is committed to reducing its carbon footprint by 20% over the next year. How many kilograms of carbon dioxide emissions must the company reduce to meet its target? (5 marks) [10]
- ii) Recommend a few initiatives to promote recycling and decrease waste for the manufacturing company with higher carbon footprints. (5 marks)
04. Assume that you are the leading strategist for a city aiming to become a model of sustainable development. With energy as a primary catalyst, your task is to devise a comprehensive plan to drive sustainable transformation across various sectors. This plan must not only focus on transitioning to renewable energy sources but also encompass broader environmental, social, and economic sustainability goals. [10]



i) How would you leverage energy as a catalyst to boost sustainable transformation in the city? **(5 marks)**

ii) Outline the key components of your strategy, including initiatives to promote renewable energy adoption, improve energy efficiency, and foster community engagement. **(5 marks)**

05. You are a security consultant advising a city government on enhancing physical security in a smart city environment. Given recent incidents of vandalism and theft in public spaces, the city is considering deploying surveillance cameras as part of its security measures. Analyze the types of security threats that could be mitigated through the installation of surveillance cameras, considering factors such as public safety, privacy concerns, and infrastructure vulnerabilities. Develop a comprehensive plan outlining the deployment strategy, camera placement, data storage, and monitoring protocols to maximize the effectiveness of surveillance in addressing the identified security challenges while minimizing potential drawbacks. **(10 marks)** [10]

06. In metropolitan cities, air pollution is a major issue due to high levels of particulate matter that can cause long-term damage to the lungs. IoT along with machine learning can be used to reduce air pollution. Explore the role of IoT technology in collecting various pollutant information from different sources and identify pollution forecasts using any prediction models to arrive at mitigation for air pollution. Depict the efficiency of the prediction model with proper explanation. **(10 marks)** [10]

07. You are a financial advisor for a mid-sized city aiming to implement a comprehensive smart city initiative focused on upgrading its transportation infrastructure. The city plans to introduce smart traffic management systems, deploy electric vehicle charging stations, and enhance public transportation services. However, the city lacks sufficient funds to finance these projects upfront and faces challenges in securing financing from traditional sources due to budget constraints and limited creditworthiness. [10]

i) Devise a targeted financing strategy specifically tailored to address the funding shortfall for the city's transportation-focused smart city initiative. **(5 marks)**

ii) Explore 3 innovative financing mechanisms like infrastructure bonds to generate upfront capital for project implementation while spreading out repayment obligations over time. **(5 marks)**

08. You are a data analyst working for a city government tasked with evaluating the performance of the city's smart waste management system. The system, which relies on IoT sensors installed in waste bins to optimize waste collection routes, has been in operation for six months. However, there are concerns about its effectiveness in improving waste collection efficiency, reducing operational costs, and enhancing overall service quality. [10]

i) Discuss the key performance indicators (KPIs) to assess the system's performance against predefined targets and industry benchmarks. **(5 marks)**

ii) Conduct comparative analyses to identify areas of improvement, best practices, and potential bottlenecks in the waste management process. **(5 marks)**

09. You are a structural engineer overseeing the maintenance of a smart city's iconic suspension bridge, which serves as a critical transportation link connecting various parts of the city. Recent inspections have revealed signs of structural degradation and fatigue in certain sections of the bridge, raising concerns about its long-term safety and reliability. However, traditional inspection methods are limited in their ability to provide real-time data on the bridge's structural health and monitor changes over time. [10]



i) Develop a targeted structural health monitoring (SHM) solution specifically designed to address the identified issues and ensure the safety and integrity of the bridge. **(5 marks)**

ii) Design a smart system utilizing advanced sensor technologies to continuously monitor key structural parameters, including load distribution, vibration frequencies, and corrosion rates. **(5 marks)**

10. You are a transportation engineer working on implementing an Internet of Vehicles (IoV) system in a smart city to improve road safety and traffic management. However, the city has experienced an increase in traffic accidents, particularly at intersections, despite the deployment of IoV technologies. Investigations reveal that the IoV system is not effectively detecting and responding to potential collision risks, leading to concerns about the system's reliability and effectiveness in enhancing road safety. **[10]**

i) Develop a targeted solution with a flow chart to address the challenges with intersection safety and improve the effectiveness of the IoV system in reducing traffic accidents. **(5 marks)**

ii) Propose intelligent traffic management algorithms to analyze real-time data from vehicles, infrastructure, and weather conditions to predict and prevent potential collisions. **(5 marks)**

