VIT

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

Final Assessment Test(FAT) - Apr/May 2025

Programme	**B.Tech.**	Semester	**Winter Semester 2024-25**
Course Code	**BCSE316L**	Faculty Name	**Prof. Sandosh**
Course Title	**Design of Smart Cities**	Slot	**G2+TG2**
		Class Nbr	**CH2024250502240**
Time	**3 hours**	Max. Marks	**100**

Instructions To Candidates

- Write only your registration number in the designated box on the question paper. Writing anything elsewhere on the question paper will be considered a violation.

Course Outcomes

CO1 : Ascertain and describe the basic concepts of smart and sustainable cities.
CO2 : Comprehend the knowledge of urban planning and sustainability in smart cities.
CO3 : Analyze the security issues and challenges of smart cities and their advancements.
CO4 : Incorporate project management, planning, and stack holders in the design and development of smart cities.
CO5 : Investigate the various ICT and data analytics to connect government, urban planners, universities, city developers, and communities.

Answer all Questions (10 × 10 Marks)

01. A coastal town is experiencing frequent flooding and water contamination issues due to climate change. To improve environmental monitoring, the local authorities plan to implement a smart monitoring system but face budget constraints. To enhance data collection, they decide to integrate community remote sensing along with government sensors.
    a. Explain how community remote sensing can help in this situation (3 marks)
    b. List and describe any 7 components required for an effective community remote sensing system (7 marks).
    [10] (CO1/K2)

02. A metropolitan city is rapidly expanding its infrastructure and digital services to become a smart city. To improve connectivity, resource distribution, and efficient governance, the city is developing an cohesive urban network that connects transportation, communication, and public services.
    a. Analyze the role of an urban network in shaping the development of smart cities. (5 Marks)
    b. List and justify the measures used to assess the efficiency and effectiveness of an urban network in a smart city. (5 Marks)
    [10] (CO2/K1)

03. Imagine you are appointed as a Junior Urban Planner responsible for developing strategies to improve a metropolitan city Bangalore. The city is facing challenges such as traffic congestion, inefficient land use, and environmental degradation. You are tasked with the following,
    a. Give the importance of technology in urban planning to solve the city challenges. (2 Marks)
    b. Classify the different types of urban planning and explain their significance in sustainable city development. (8 Marks)
    [10] (CO2/K2)

04. Assume you are an Urban Data Analyst responsible for managing and utilizing data to improve city planning and development. The city council is looking to enhance decision-making processes by leveraging urban databases for better resource allocation, infrastructure planning, and environmental management.
    a. Examine the roles and benefits of urban databases in supporting efficient city planning and management. (4 Marks)
    b. Categorize the different types of urban databases and give their importance in urban development. (6 Marks)
    [10] (CO3/K3)

05. You are recruited as an Energy Management Officer presenting at an international conference on smart cities. Your role is to highlight the importance of energy in driving urban transformation and discuss key factors influencing energy-related decisions in smart city development.
    a. Define energy and explain how energy acts as a catalyst for sustainable transformation in smart cities. (5 Marks)

b. Discuss in detail about the Cohesion and Efficiency in Energy Systems. (5 Marks)

[10] (CO3/K3)

06. Assume you are attending the final year placement interview and you are asked to identify the following types of attack by the recruiter. Identify and define the following attacks to get your offer.
a. An attacker has fixed his friend as a target pretending to be a trusted partner and requesting confidential information. (2 Marks)
b. An attacker targets a software vulnerability that is unknown to the vendor, exploiting it before a patch is released. (2 Marks)
c. A user opens an email attachment which encrypts all the files and demands payment for the decryption key. (2 Marks)
d. A malicious program attaches itself to legitimate files and spreads when opened corrupting system data. (2 Marks)
e. A standalone malicious program self-replicates rapidly across multiple computers without user action consuming more memory and slowing operations. (2 Marks)

[10] (CO3/K4)

07. As an Urban Development Officer Trainee, you are tasked to assess the progress of smart city initiatives in your native. Your supervisor has asked you to provide an analysis of smart city development based on its core dimensions and measurable indicators.
a. As part of your report, identify and explain all the Dimensions of a Smart City that contribute to its efficiency, sustainability, and citizen well-being. (5 Marks)
b. To justify your assessment, list respective key indicators for each dimension that is used to measure the effectiveness of a Smart City. (5 Marks)

[10] (CO4/K3)

08. Imagine you are a Policy Advisor for Smart City Development in the Ministry of Urban Affairs. The government is focusing on enhancing governance frameworks for smart cities, and you have been asked to present the following,
a. Clarify the importance of Smart City Governance and its crucial role in ensuring well-organized urban management. (5 Marks)
b. Illustrate the components involved in the governance of Smart Cities that support effective policy implementation. (5 Marks)

[10] (CO4/K4)

09. Assume you are a Traffic Management Consultant Intern assigned to study modern transportation solutions for reducing congestion and improving road safety in your city. The city's transport department is exploring the implementation of Intelligent Transport Systems (ITS) to enhance mobility, safety, and sustainability.
a. Analyze the concept of Intelligent Transport Systems (ITS) and examine its role in improving traffic management. (5 Marks)
b. Evaluate the safety and environmental impacts of ITS in order to contribute to accident reduction and environmental sustainability. (5 Marks)

[10] (CO5/K2)

10. Imagine you are a Civil Engineering Trainee working on a government project aimed at ensuring the safety and durability of bridges and high-rise buildings. Your team is implementing Structural Health Monitoring (SHM) to prevent failures and enhance maintenance strategies. Now you train your team with the following steps.
a. Define Structural Health Monitoring (SHM) and justify its purpose. (3 Marks)
b. Analyze different Structural Health Monitoring techniques and evaluate how they help in detecting and preventing structural failures. (7 Marks)

[10] (CO5/K4)

BL-Bloom's Taxonomy Levels - (K1-Remembering,K2-Understanding,K3-Applying,K4-Analysing,K5-Evaluating,K6-Creating)

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Programme	B.Tech.	Semester	Winter Semester 2024-25
Course Code	BCSE316L	Faculty Name	Prof. A Swaminathan
Course Title	Design of Smart Cities	Slot	G1+TG1
		Class Nbr	CH2024250502243
Time	3 hours	Max. Marks	100

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Answer all Questions (10 × 10 Marks)

01. The Indian Government plans to rank smart cities based on their urban network efficiency. To establish a data-driven ranking system, urban planners have been tasked with formulating an equation that incorporates at least five key urban network measures.
As an urban planner, you are responsible for designing this equation to help policymakers assess a city's transportation efficiency, accessibility, and resilience.
(a) Formulate an equation that integrates at least five key urban network measures, such as connectivity, betweenness, closeness, straightness, and reach. [3 Marks]

(b) Explain the role, purpose, and significance of each parameter in determining urban network efficiency. Provide relevant examples to illustrate their impact. [7 Marks]

[10] (CO1/K2)

02. The rapid expansion of metropolitan cities is facing rapid population growth, infrastructure strain, and environmental concerns. The government has allocated funds to redesign the urban landscape while ensuring sustainability, efficiency, and resilience. As an urban planner, you have been invited to propose a future-proof urban planning model that integrates fundamental principles, key dimensions, and technological advancements.
(a) Mention the major challenges in urban planning, highlight emerging trends shaping urban development, and propose an urban planning model with at least five key principles. Justify how each principle supports sustainability and functionality. [7 Marks]

(b) Discuss key dimensions of urban planning, their interdependencies in smart city development, and the role of emerging technologies. [3 Marks]

[10] (CO1/K3)

03. Metropolitan city "A" is experiencing fragmented infrastructure, inefficient resource management, and high energy consumption. To address these challenges, the local government aims to transform it into a highly cohesive and energy-efficient smart city by integrating sustainable energy solutions, advanced technology, and urban planning strategies.
(a) Propose a framework to enhance urban cohesion by integrating transportation, governance, and digital infrastructure. Explain how interconnected urban systems contribute to efficiency and resilience. [6 Marks]

(b) Identify the key barriers to achieving urban cohesion and energy efficiency. Explain how emerging technologies such as IoT, blockchain, and predictive analytics can help overcome these challenges. [4 Marks]

[10] (CO2/K3)

04 "B" is a well-grown smart city that has expanded its digital infrastructure, integrating IoT-enabled public services, smart governance platforms, and AI-driven citizen engagement systems. However, social engineering attacks are on the rise, targeting city officials, public sector employees, and citizens.

(a) Analyze how social engineering attacks exploit users in smart cities. Propose a multi-layered defense strategy using policy measures, awareness training, AI-driven threat detection, and multi-factor authentication. [7 Marks]

(b) Discuss the ethical and legal challenges in combating AI-driven social engineering threats. How can regulations balance privacy and security? [3 Marks]

[10] (CO2/K4)

05 As smart cities evolve, global standards such as ISO 37120 (Indicators for city services and quality of life), ISO 37122 (Indicators for smart cities), and ITU-T standards play a crucial role in ensuring interoperability, efficiency, and sustainability.

(a) Analyze the importance of global standards in guiding smart city development. How do these standards ensure consistency in service quality, data management, and infrastructure? [4 Marks]

(b) Considering the diverse urban landscapes across different countries, discuss the challenges in implementing a universal smart city standard. Additionally, explain how cities can adapt to maintain compliance while addressing local needs. [6 Marks]

[10] (CO3/K4)

06. A developing nation is striving to enhance its smart city performance benchmarks while facing financial constraints in implementing large-scale projects.

(a) As a smart city strategist, propose a data-driven performance benchmarking framework to assess and compare a city's smart infrastructure, governance, sustainability, and service efficiency. How should policymakers ensure that performance benchmarks remain practical, scalable, and adaptable? [6 Marks]

(b) Given limited government budgets, identify and explain alternative financing models that can be leveraged to support smart city development. Discuss their advantages and risks. [4 Marks]

[10] (CO3/K5)

07. The smart city's metro system of "C" has reported frequent infrastructure failures due to aging components and unpredictable stress loads. Modern urban infrastructure relies on advanced structural concepts to enhance durability, sustainability, and resilience. A city plans to construct a high-rise smart building in a seismic-prone zone.

(a) How can structural concepts such as load distribution, material optimization, and adaptive design be applied to ensure safety and longevity? Propose a structural health monitoring (SHM) system that can predict, detect, and mitigate structural failures in real time. How can IoT-based sensors, AI-driven data analytics, and digital twins enhance preventive maintenance? [6 Marks]

(b) In process control and stabilization, how can real-time feedback loops, automated diagnostics, and AI-driven stabilization techniques improve the safety and reliability of critical smart city structures, such as metro tunnels and water reservoirs? [4 Marks]

[10] (CO4/K5)

08. "D" is a Fastly emerging smart city deploying IoV-based Intelligent Transport Systems (ITS) to enhance traffic flow, reduce congestion, and improve public transportation efficiency.

(a) Considering the importance of IoV, how can real-time vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication optimize traffic management? Propose an IoV-based smart traffic system and analyze its impact on urban mobility and emergency response times. [5 Marks]

(b) Mention the challenges arise when integrating IoV with AI-driven traffic prediction and automated vehicle coordination. How can these challenges be addressed to enhance ITS efficiency? [5 Marks]

[10] (CO4/K6)

09. A smart city initiative aims to enhance citizen engagement and urban service efficiency by deploying a web-based platform for real-time governance, utility monitoring, and traffic management.

(a) As a project manager, how would you design a scalable and secure web application that integrates IoT data, cloud services, and AI-driven analytics? [5 Marks]

(b) Mention the key challenges (such as cybersecurity, data integration, and user adoption) that must be addressed to ensure the platform's sustainability and success? Provide an example of a real-world smart city that has successfully implemented a similar system. [5 Marks]

[10] (CO5/K6)

10. Large metropolitan cities are implementing a web-based smart city management system to optimize traffic control, waste management, and public service delivery. However, challenges such as data silos, interoperability issues, cybersecurity risks, and citizen engagement have emerged.

(a) As a smart city project manager, propose a comprehensive project plan that addresses these challenges. How would you ensure seamless integration with existing infrastructure while maintaining data security, scalability, and user adoption? [7 Marks]

(b) Provide an example of a successful web-based smart city initiative and analyze the key success factors behind its implementation. [3 Marks]

[10] (CO5/K6)

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