SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

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DEPARTMENT OF MECHANICAL ENGINEERING

B.E MECHANICAL ENGINEERING

Question Bank

Regulations - 2023

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V SEMESTER

PME302 CARBON FOOT PRINT ESTIMATION AND REDUCTION TECHNIQUES

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DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

SUBJECT / SUBJECT CODE : Carbon Foot Print Estimation and Reduction Techniques / PME 302

SEM/YEAR : V / III

UNIT – I CLIMATE CHANGE AND CARBON FOOTPRINT

Green House Effect and Climate Change - Causes and Impacts of Climate Change – Economic Implications of Climate Change -IPCC Reports and Projected Climate Change Scenarios – Green House Gas (GHG) Emission – Carbon Footprint of Activities, Processes, Products and Services of Organisations – GHG Emission factors and Calculations

PART-A (2 Marks)

Q.No	Questions	BT Level	Competence
1.	Define the greenhouse effect.	BT-1	Remembering
2.	Name two major greenhouse gases.	BT-3	Applying
3.	State one human and one natural cause of climate change.	BT-2	Understanding
4.	Mention one impact of climate change on agriculture.	BT-2	Understanding
5.	How does climate change affect the economy?	BT-1	Remembering
6.	Give one example of how businesses are economically affected by climate change.	BT-2	Understanding
7.	What does IPCC stand for?	BT-1	Remembering
8.	Examine how agriculture contributes to greenhouse gas emissions.	BT-1	Remembering
9.	What is meant by the carbon footprint of an organization?	BT-2	Understanding
10.	What is the main purpose of the IPCC reports in relation to climate change?	BT-2	Understanding
11.	Justify the need for reducing GHG emissions in developing countries.	BT-1	Remembering
12.	What do projected climate change scenarios in IPCC reports indicate about global temperature trends?	BT-1	Remembering
13.	Describe the relationship between carbon footprint and climate change.	BT-1	Remembering
14.	Why methane is considered a powerful greenhouse gas?	BT-2	Understanding
15.	Identify a situation where deforestation contributes to climate change.	BT-1	Remembering
16.	Name two tools used to calculate carbon footprints.	BT-2	Understanding

17.	How is carbon footprint different from ecological footprint?	BT-1	Remembering
18.	Apply carbon accounting to assess a delivery service's impact using fossil-fueled vehicles.	BT-2	Applying

19.	Compare carbon emissions from renewable energy vs. fossil fuels.	BT-2	Analyzing
20.	Assess the environmental impact of a product with high upstream emissions.	BT-1	Remembering
21.	Analyze the impact of packaging on product-level carbon footprint.	BT-2	Analyzing
22	Define GHG emission factor.	BT-2	Evaluating
23	Explain how emission factors help in estimating carbon footprints.	BT-2	Analyzing
24	Why is it important to consider the life cycle of a product when calculating emissions?	BT-1	Remembering
25	Identify possible emission sources in a hospital's daily operations.	BT-1	Remembering

PART-B (16 Marks)

Q.No	Questions	Marks	BT Level	Competence
1.	Describe key terms associated with climate change, such as global warming, radiative forcing, and carbon footprint.	16	BT-4	Remembering
2.	Explain the process of the greenhouse effect and how it contributes to global warming.	16	BT-3	Analyzing
3.	Discuss how human activities contribute to climate change. Include examples from different sectors.	16	BT-3	Remembering
4.	Illustrate the link between industrialization and rising greenhouse gas emissions with real-world data.	16	BT-4	Analyzing
5.	Analyze the direct and indirect impacts of climate change on agriculture, water resources, and public health.	16	BT-3	Remembering
6.	Compare the economic implications of climate change in developing countries versus developed countries.	16	BT-4	Remembering
7.	Explain the key findings of the latest IPCC Assessment Report regarding global temperature rise and sea-level projections.	16	BT-3	Understanding
8.	Describe the role of Greenhouse Gases (GHGs) in climate change and explain the major sources of GHG emissions globally.	16	BT-4	Understanding

9.	(i) Summarize the projected climate change scenarios presented in the IPCC Sixth Assessment Report. (ii) Apply the concept of GHG emission factors to calculate the carbon footprint of a small manufacturing company using assumed data.	8 8	BT-4	Understanding

10.	(i) Analyze the differences between the Shared Socioeconomic Pathways (SSPs) in IPCC reports and how each leads to varied climate outcomes. (ii) Compare and contrast the emission trends of CO_2, CH_4, and N_2O in developed vs. developing countries using IPCC data.	8 8	BT-3	Applying
11.	Evaluate the effectiveness of international policies (e.g., Paris Agreement) in reducing GHG emissions in light of IPCC projections.	16	BT-4	Remembering
12.	Explain the concept of carbon footprint in the context of organizational operations. How does it differ from individual carbon footprints?	16	BT-6	Creating
13.	Analyze the carbon footprint of a manufacturing company by breaking down emissions from energy, transportation, and waste. Highlight which area contributes the most and why.	16	BT-3	Understanding
14.	Evaluate two carbon footprint reduction strategies used in the IT industry. Discuss their feasibility, cost, and long-term sustainability.	16	BT-5	Evaluating
15.	Design a carbon audit plan for a mid-sized organization, including the identification of emission sources, emission factor selection, data collection methods, and reporting.	16	BT-4	Analyzing
16.	Critically evaluate the reliability of carbon footprint calculators available online. What are the major limitations in their methodology and data accuracy?	16	BT-5	Evaluating
17.	Propose a GHG reduction action plan for a service-sector organization. Include key metrics, timelines, responsibilities, and expected outcomes.	16	BT-4	Analyzing
18.	Differentiate between direct and indirect GHG emissions with examples. How are these accounted for in organizational carbon footprint calculations?	16	BT-3	Remembering

UNIT – II PRODUCT LIFE CYCLE AND GHG EMISSIONS			
Life-cycle GHG Accounting - Principles of Product Life Cycle GHG Accounting and Reporting - Fundamentals of Product Life Cycle GHG Accounting - Establishing the Scope of a Product Inventory- GHG Emission Inventories and Accounting - Collecting Data and Assessing Data Quality Allocation and Assessing Uncertainty.			
PART-A (2Marks)			
Q.No	**Questions**	**BT Level**	**Competence**
1.	Define the term 'Life-cycle GHG Accounting'.	BT-1	Remembering
2.	What are the four main stages of a product life cycle in GHG accounting?	BT-2	Understanding
3.	List any two principles of life-cycle GHG accounting.	BT-1	Remembering
4.	Differentiate between 'cradle-to-gate' and 'cradle-to-grave' boundaries.	BT-2	Applying
5.	Explain the principle of 'transparency' in GHG reporting.	BT-1	Remembering
6.	Why is 'allocation' important in product life-cycle GHG accounting?	BT-2	Analyzing
7.	Identify two tools used for product life-cycle GHG assessment.	BT-2	Applying
8.	How does system boundary selection affect GHG estimates?	BT-2	Understanding
9.	What is the role of functional units in product GHG accounting?	BT-2	Understanding
10.	Justify the need for third-party verification in GHG reporting.	BT-1	Remembering
11.	Define the term “Product Life Cycle GHG Accounting”.	BT-1	Remembering
12.	What is the purpose of establishing the scope in a product GHG inventory?	BT-2	Applying
13.	List the main stages of a product’s life cycle relevant to GHG accounting.	BT-1	Analyzing
14.	Differentiate between scope 1, scope 2, and scope 3 emissions in GHG accounting.	BT-2	Analyzing
15.	Why is boundary setting important in product life cycle GHG assessments?	BT-1	Remembering
16.	Identify any two functional units used in product GHG accounting.	BT-1	Remembering
17.	Describe the difference between cradle-to-gate and cradle-to-grave assessments.	BT-2	Understanding
18.	What is a GHG emission inventory?	BT-1	Remembering
19.	Explain why data quality is important in GHG accounting.	BT-1	Remembering
20.	How would you apply emission factors in calculating GHG emissions?	BT-1	Remembering
21.	Identify two common sources of uncertainty in GHG emission inventories.	BT-2	Understanding
22	Assess the effectiveness of using default emission factors for a national GHG inventory.	BT-1	Remembering

23	Evaluate why sectoral data disaggregation is crucial in GHG accounting.	BT-2	Understanding
24	Propose a simple framework for collecting GHG data in a small manufacturing unit.	BT-2	Understanding
25	Design a basic uncertainty analysis plan for a company's carbon footprint.	BT-1	Remembering

PART-B (16 Marks)

Q.No	Questions	Marks	BT Level	Competence
1.	Define life-cycle GHG accounting. Explain the key terms associated with product life-cycle GHG emissions.	16	BT-3	Understanding
2.	Explain the stages involved in the life cycle of a product and how each stage contributes to GHG emissions.	16	BT-4	Remembering
3.	Using a hypothetical example of a bottled water product, apply the principles of life-cycle GHG accounting to estimate emissions across different stages.	16	BT-3	Remembering
4.	Analyze the importance of system boundary setting and allocation methods in life-cycle GHG assessment. How do different choices affect the results?	16	BT-4	Understanding
5.	Evaluate the effectiveness of using life-cycle GHG accounting in reducing the carbon footprint of products. What are the advantages and limitations?	16	BT-3	Remembering
6.	Design a GHG reporting framework for a consumer electronics product using life-cycle principles. Include stages, emission sources, and reporting formats.	16	BT-3	Remembering
7.	Discuss the principles of transparency, completeness, consistency, comparability, and accuracy in GHG life-cycle reporting.	16	BT-3	Applying

8.	(i) Examine how product design decisions influence the overall life-cycle GHG emissions and suggest improvements. (ii) Analyze the key steps involved in conducting a Product Life Cycle GHG inventory and evaluate their challenges.	8 8	BT-4	Understanding
9.	(i) Explain the concept of Product Life Cycle GHG Accounting and its significance in sustainability practices. (ii) Describe the principles of relevance, completeness, consistency, transparency, and accuracy in product GHG accounting. Illustrate	8 8	BT-4	Understanding

	with examples.			
10.	Compare and contrast Cradle-to-Gate and Cradle-to-Grave approaches in product life cycle GHG accounting. Which is more suitable for consumer products and why?	16	BT-6	Creating
11.	(i) Develop a GHG accounting boundary for a consumer product (e.g., a plastic bottle or a laptop). Include scope, functional unit, and system boundaries. (ii) Assess the role of ISO 14067 and GHG Protocol Product Standard in defining the scope of a product inventory.	8 8	BT-4	Analyzing
12.	Define the key components of a GHG emission inventory and list the major greenhouse gases tracked under the Kyoto Protocol.	16	BT-4	Analyzing
13.	Explain the process of collecting activity data and emission factors in GHG emission accounting. Why is data quality important in this context?	16	BT-3	Applying
14.	Apply the IPCC guidelines to create a basic emission inventory for a manufacturing unit. Illustrate the steps involved.	16	BT-4	Analyzing
15.	Analyze the implications of poor-quality data on GHG emission inventories. How can data quality assessment frameworks mitigate these issues?	16	BT-4	Analyzing
16.	Critically assess the challenges and methods of uncertainty assessment in GHG emission accounting.	16	BT-3	Applying
17.	Design a GHG data collection and quality assurance protocol for a medium-sized enterprise to ensure reliable emission reporting. Include tools, roles, and procedures.	16	BT-4	Analyzing
18.	Calculate the total GHG emissions for a small organization using hypothetical activity data and appropriate emission factors.	16	BT-3	Applying

UNIT III- METHODOLOGICAL ASPECTS OF CARBON FOOTPRINT			
Methodology for Carbon Footprint Calculation in Crop and Livestock Production, End of Life Scenarios and Carbon Footprint of Wood Cladding, Carbon Footprints and Greenhouse Gas Emission Savings of Alternative Synthetic Biofuels, Making Food Production GHG Efficient, Carbon Footprint of Wood-Based Products and Buildings, Challenges and Merits of Choosing Alternative Functional Units, modeling aspects of carbon footprint, Quantifying Spatial–Temporal Variability of Carbon Stocks and Fluxes.			
PART-A (2Marks)			
Q.No	**Questions**	**BT Level**	**Competence**
1.	Define carbon footprint in the context of agriculture.	BT-1	Remembering
2.	Explain why methane is a significant contributor to livestock carbon footprints.	BT-2	Understanding
3.	Calculate the CO_2-equivalent emissions if a dairy farm emits 100 kg of CH_4.	BT-1	Remembering
4.	Identify two key stages in crop production where significant GHG emissions occur.	BT-2	Understanding
5.	Propose a method to reduce carbon footprint in paddy cultivation.	BT-1	Remembering
6.	Justify the use of carbon footprint analysis in livestock management decisions.	BT-2	Understanding
7.	List two end-of-life scenarios considered in agricultural carbon foot printing.	BT-2	Understanding
8.	Define the term carbon footprint in the context of wood cladding.	BT-2	Understanding
9.	List two environmental benefits of using wood cladding over concrete or steel.	BT-1	Remembering
10.	Explain how synthetic biofuels help in reducing greenhouse gas emissions.	BT-1	Remembering
11.	Compare the carbon footprint of biodiesel and fossil diesel.	BT-2	Understanding
12.	State two farming practices that reduce GHG emissions in food production.	BT-1	Remembering
13.	Compare the GHG emissions from plant-based vs animal-based food systems.	BT-1	Remembering
14.	Explain why wood-based products are considered carbon sinks.	BT-3	Applying
15.	Describe the term "temporal variability" in carbon stock assessments.	BT-2	Understanding
16.	Apply the concept of carbon footprint to compare a wood house and a concrete house.	BT-2	Understanding
17.	How can modeling be applied to estimate carbon emissions in building materials?	BT-2	Understanding
18.	Analyze the impact of transportation on the carbon footprint of wood	BT-1	Remembering

	products.		
19.	Distinguish between biogenic and anthropogenic carbon emissions.	BT-1	Remembering
20.	Suggest a model structure to track carbon flux in a forest-to-building wood product system.	BT-2	Understanding
21.	Propose a method to account for spatial variability in forest carbon stocks.	BT-2	Understanding
22.	Evaluate the advantage of using "per square meter of floor area" as a functional unit.	BT-1	Remembering
23.	Why is it important to include end-of-life scenarios in carbon footprint models?	BT-2	Understanding
24.	How do land use changes affect carbon fluxes in forested regions?	BT-1	Remembering
25.	Assess the challenges of comparing carbon footprints using different functional units.	BT-2	Understanding

PART-B (16 Marks)

Q.No	Questions	Marks	BT Level	Competence
1.	Explain the methodology for carbon footprint calculation in (i) crop production, (ii) livestock production, (iii) end-of-life scenarios, and (iv) wood cladding.	16	BT-3	Remembering
2.	Explain the methodology for carbon footprint calculation in crop production systems.	16	BT-3	Applying
3.	(i) Discuss the carbon footprint estimation in livestock production and the associated emission sources. (ii) Examine the trade-offs between biofuel production and food security in the context of GHG mitigation.	8 8	BT-3	Understanding
4.	(i) Evaluate the differences between carbon footprint calculation methodologies for crop vs. livestock systems. (ii) Explain the role of emission factors and activity data in carbon footprint calculations.	8 8	BT-3	Understanding
5.	Design a simplified framework for estimating the carbon footprint of a paddy (rice) farming operation.	16	BT-3	Remembering
6.	Analyze the end-of-life carbon footprint scenarios for agricultural biomass and organic waste.	16	BT-4	Analyzing

7.	Justify the importance of incorporating end-of-life scenarios in agricultural carbon footprint assessments.	16	BT-5	Evaluating
8.	Describe the methodology used to estimate the carbon footprint of wood cladding materials in buildings.	16	BT-4	Analyzing
9.	Compare the carbon footprint of wood cladding with other common cladding materials (e.g., steel, aluminum, PVC).	16	BT-2	Understanding
10.	Assess how carbon sequestration in wood products affects the total carbon footprint in the building sector.	16	BT-3	Applying

11.	List the major sources of GHG emissions in traditional fossil fuel-based energy and compare them with synthetic biofuels.	16	BT-4	Analyzing
12.	Explain the concept of GHG emission savings in alternative synthetic biofuels with suitable examples.	16	BT-4	Analyzing
13.	Describe how food production systems contribute to GHG emissions and how efficiency can be improved.	16	BT-6	Creating
14.	Analyze the lifecycle emissions of wood-based products compared to steel or concrete alternatives.	16	BT-2	Understanding

15.	Explain the challenges and advantages of using alternative functional units in Life Cycle Assessment (LCA).	16	BT-3	Applying
16.	Describe the role of functional units in the modeling of a carbon footprint. Give suitable examples.	16	BT-3	Applying
17.	Analyze the implications of using mass-based vs service-based functional units in carbon footprint comparison.	16	BT-5	Evaluating
18.	Illustrate with an example how the choice of functional unit affects carbon footprint outcomes in LCA.	16	BT-3	Applying

UNIT IV EMISSION MITIGATION AND CARBON SINK

Setting GHG Reduction Targets and Tracking Inventory Changes – Non-Fossil Fuel based Energy Systems - Carbon Dioxide capture and Storage Technologies –Mitigation potentials of different Sectors and systems – Innovation, Technology Development and Transfer, - Social aspects of mitigation –Polcies, Institutions and international corporations – Carbon Pricing and Finance –GHG Offsetting and Green marketing.

PART-A (2Marks)

Q.No	Questions	BT Level	Competence
1.	Define GHG reduction targets.	BT-2	Understanding
2.	List two benefits of setting GHG reduction targets.	BT-2	Understanding
3.	Explain the role of baselines in GHG tracking.	BT-1	Remembering
4.	Identify two types of non-fossil fuel-based energy systems.	BT-1	Remembering
5.	Distinguish between Scope 1 and Scope 2 emissions in inventory tracking.	BT-1	Remembering
6.	Suggest a strategy for reducing GHGs using renewable energy.	BT-2	Understanding
7.	State one reason why organizations track changes in GHG inventory.	BT-1	Remembering
8.	Why is stakeholder engagement important in setting GHG reduction targets?	BT-2	Understanding
9.	Compare fossil fuel-based and non-fossil fuel-based energy systems in terms of GHG emissions.	BT-1	Remembering
10.	What is Carbon Capture and Storage (CCS)?	BT-2	Understanding
11.	Name any two major components of a typical CCS system.	BT-1	Remembering
12.	Why CCS is considered a climate change mitigation strategy?	BT-1	Remembering
13.	Explain the term “post-combustion capture” in CCS.	BT-1	Remembering
14.	How can CCS be applied in the cement industry?	BT-1	Remembering
15.	Give an example of a natural CO_2 storage site.	BT-1	Remembering
16.	Compare the CO_2 mitigation potential of CCS in the power sector vs. the transport sector.	BT-2	Applying
17.	Suggest one innovative method to enhance CO_2 storage capacity in geological formations.	BT-2	Understanding
18.	Define clean technology in the context of climate change mitigation.	BT-2	Understanding
19.	Explain the term "technology transfer" in relation to climate mitigation.	BT-1	Remembering
20.	Give one example of how innovation can be applied to reduce greenhouse gas emissions in agriculture.	BT-1	Remembering
21.	Differentiate between hard and soft technologies in climate change mitigation.	BT-1	Remembering

22.	Assess the role of community participation in successful technology adoption for mitigation.	BT-2	Understanding
23.	Explain the concept of GHG offsetting in simple terms.	BT-2	Understanding
24.	How can an organization use green marketing to promote eco-friendly products?	BT-2	Understanding
25.	Name two international institutions involved in climate governance.	BT-2	Applying

PART-B (16 Marks)

Q.No	**Questions**	**Marks**	**BT Level**	**Competence**
1.	Explain the significance of setting GHG reduction targets in national and organizational contexts.	16	BT-3	Applying
2.	Demonstrate how a company can use carbon accounting tools to monitor changes in its emissions inventory over a 5-year period.	16	BT-3	Applying
3.	Analyze the challenges faced by developing countries in adopting non-fossil fuel-based energy systems for GHG mitigation.	16	BT-4	Analyzing
4.	Evaluate the effectiveness of carbon offsetting mechanisms in achieving long-term GHG reduction targets.	16	BT-5	Evaluating
5.	Design a GHG reduction strategy for a smart city that integrates renewable energy, efficient transport, and waste management.	16	BT-5	Evaluating
6.	Illustrate how Life Cycle Assessment (LCA) can be used to compare fossil fuel and non-fossil fuel-based energy systems in terms of GHG emissions.	16	BT-3	Applying
7.	Examine the relationship between policy instruments (e.g., subsidies, carbon pricing) and the adoption of renewable energy technologies.	16	BT-3	Applying
8.	Critically assess the role of decentralized renewable energy systems in reducing national carbon footprints.	16	BT-4	Analyzing
9.	Evaluate the effectiveness of different Carbon Dioxide Capture technologies (pre-combustion, post-combustion, and oxy-fuel combustion) in reducing GHG emissions.	16	BT-5	Evaluating
10.	Explain the major components of the Carbon Capture and Storage (CCS) process. Illustrate each with suitable diagrams.	16	BT-5	Evaluating
11.	Analyze the potential and limitations of CCS in the industrial sector (steel, cement, chemical) for deep decarbonization.	16	BT-3	Applying

12.	Assess the role of the energy sector in implementing CCS and compare it with alternative mitigation technologies like renewable energy and energy efficiency.	16	BT-3	Applying
13.	Describe the regulatory, economic, and environmental challenges associated with large-scale CCS deployment. Suggest policy solutions.	16	BT-4	Analyzing
14.	Describe the key international frameworks that support technology development and transfer for climate change mitigation.	16	BT-5	Evaluating
15.	Evaluate the effectiveness of the Clean Development Mechanism (CDM) in supporting technology transfer for climate mitigation.	16	BT-5	Evaluating
16.	Describe the role of carbon pricing mechanisms, such as carbon taxes and emission trading systems, in reducing GHG emissions. Use relevant case studies to illustrate their impact.	16	BT-3	Applying
17.	Apply the concept of GHG offsetting to design a carbon-neutral plan for a mid-sized manufacturing company. Explain the steps involved and the tools used.	16	BT-3	Applying
18.	Evaluate the effectiveness of the Clean Development Mechanism (CDM) under the Kyoto Protocol in promoting sustainable development in developing countries.	16	BT-4	Analyzing

UNIT-V CASE STUDIES

Carbon Footprint Estimation from Building Sector - Urban Carbon Footprint Evaluation - Applications of carbon footprint in urban planning – Mechanical Equipment and Electronic Product Carbon Footprint - Carbon Footprint of Aqua and Agriculture products- GHG Emissions from Municipal Wastewater Treatment and Solid waste management.

PART-A (2Marks)

Q.No	Questions	BT Level	Competence
1.	Define the term carbon footprint in the context of the building sector.	BT-1	Remembering
2.	Explain how building materials contribute to a building's carbon footprint.	BT-1	Remembering
3.	How can energy-efficient lighting reduce carbon emissions in buildings?	BT-2	Understanding
4.	Compare operational and embodied carbon in a building's life cycle.	BT-2	Understanding
5.	Assess the impact of green building certifications on urban carbon reduction goals.	BT-3	Applying
6.	List two major sources of carbon emissions in urban areas.	BT-1	Remembering
7.	Describe how urban density influences carbon emissions.	BT-1	Remembering
8.	Illustrate one method urban planners use to reduce carbon footprints in cities.	BT-1	Remembering
9.	Why is carbon footprint evaluation important in urban planning?	BT-1	Remembering
10.	Propose a low-carbon strategy for retrofitting old urban buildings.	BT-2	Understanding
11.	What is meant by the term "carbon footprint" of an electronic product?	BT-1	Remembering
12.	Explain why electronic products often have higher embodied carbon than mechanical equipment.	BT-1	Remembering
13.	How would you estimate the carbon footprint of a mechanical pump used in an industrial facility?	BT-3	Applying
14.	Compare the carbon footprints of a desktop computer and a laptop. What factors contribute to the differences?	BT-1	Remembering
15.	List two major stages in the life cycle of electronic products that contribute most to their carbon footprint.	BT-2	Understanding
16.	Why is e-waste a concern in terms of carbon emissions?	BT-1	Remembering
17.	Analyze the impact of energy efficiency on the operational carbon footprint of mechanical equipment.	BT-2	Understanding
18.	Define the term carbon footprint in the context of agricultural products.	BT-2	Understanding
19.	List two major GHGs emitted during solid waste management processes.	BT-2	Understanding

20.	Explain how aquaculture contributes to greenhouse gas emissions.	BT-1	Remembering

21.	Describe the role of aerobic vs. anaerobic processes in GHG emissions from wastewater treatment.	BT-1	Remembering
22	Suggest one way in which municipalities can reduce GHG emissions from solid waste management.	BT-1	Remembering
23	Compare the GHG emissions of conventional farming with organic farming.	BT-2	Understanding
24	Analyze the sources of emissions in the life cycle of an agricultural product like rice.	BT-2	Understanding
25	Propose an integrated approach to minimize carbon footprint in wastewater treatment plants.	BT-1	Remembering

PART-B (16 Marks)

Q. No	Questions	Marks	BT Level	Competence
1.	Explain the components contributing to carbon emissions in the building sector. Illustrate with examples from urban environments.	16	BT-3	Applying
2.	Apply standard carbon footprint estimation methods to evaluate a mid-rise residential building in an urban setting. Detail the process and assumptions made.	16	BT-3	Applying
3.	Analyze the differences in carbon footprint between green buildings and conventional buildings in metropolitan cities. What factors contribute to the variations?	16	BT-3	Applying
4.	Evaluate the role of energy systems (lighting, HVAC, water heating) in the total carbon footprint of buildings. How does urban density influence these impacts?	16	BT-4	Analyzing
5.	Critically evaluate various tools and software (e.g., RETScreen, SIMAPRO, eQuest) used for carbon footprint assessment in urban planning. Which are most effective and why?	16	BT-5	Evaluating
6.	Propose an urban development plan for a smart city with a focus on minimizing building-sector carbon emissions. Include transportation, infrastructure, and behavioral aspects.	16	BT-5	Evaluating
7.	Develop a decision-support system for municipal planners using carbon footprint data to prioritize urban retrofit projects. Explain the data sources, indicators, and decision rules.	16	BT-3	Applying

8.	Compare and contrast the carbon footprint of typical mechanical equipment and electronic products across their life cycles. Discuss contributing factors using LCA principles	16	BT-3	Applying
9.	Explain how aquaculture and agricultural activities contribute to greenhouse gas emissions. Illustrate with real-world examples."	16	BT-4	Analyzing
10.	Apply carbon footprint assessment techniques to evaluate the environmental impact of a dairy production system."	16	BT-5	Evaluating
11.	Critically evaluate the effectiveness of low-carbon agricultural practices such as no-till farming, organic composting, or precision irrigation in reducing GHG emissions."	16	BT-5	Evaluating
12.	Describe the mechanisms by which methane and nitrous oxide are emitted during wastewater and solid waste treatment."	16	BT-3	Applying
13.	Demonstrate how to calculate GHG emissions from a municipal solid waste landfill using IPCC Tier 1 methodology."	16	BT-3	Applying
14.	Analyze the differences in GHG emissions between aerobic composting, anaerobic digestion, and landfilling.	16	BT-4	Analyzing
15.	Evaluate current municipal solid waste management practices in your region in terms of their carbon intensity and suggest improvements."	16	BT-5	Evaluating
16.	Design a low-carbon municipal waste treatment system integrating renewable energy, advanced treatment technologies, and carbon capture methods."	16	BT-5	Evaluating
17.	Explain the role of landfill gas (LFG) recovery in mitigating emissions and improving energy efficiency.	16	BT-3	Applying
18.	Evaluate strategies to reduce GHG emissions from secondary treatment processes in a municipal wastewater facility.	16	BT-3	Applying