SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

VIII SEMESTER

1909801 GREEN MANUFACTURING

Regulation – 2019

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Prepared by

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SUBJECT CODE/NAME: 1909801 GREEN MANUFACTURING

SEM/YEAR: VIII/IV

UNIT I - INTRODUCTION			
Environmental Effects of Design – Environmental Damage – Inefficient Energy Use – Design for Recycling.			
PART A (2 Marks)			
Q.NO	**QUESTIONS**	**BT LEVEL**	**COMPETENCE**
1.	What is meant by the environmental effects of design?	1	Remember
2.	How do design decisions influence environmental performance?	2	Understand
3.	What is life-cycle thinking in design?	1	Remember
4.	Mention two environmental impacts caused by poor product design.	1	Remember
5.	How does product design affect resource consumption?	2	Understand
6.	What is environmental damage?	1	Remember
7.	List two causes of environmental damage due to industrial activities.	1	Remember
8.	What is meant by ecosystem degradation?	1	Remember
9.	How does environmental damage affect human health?	2	Understand
10.	State two long-term effects of environmental damage.	2	Understand
11.	What is inefficient energy use?	1	Remember
12.	Mention two causes of energy inefficiency in manufacturing.	1	Remember
13.	How does inefficient energy use contribute to pollution?	2	Understand

14.	State two impacts of energy wastage on the economy.	2	Understand
15.	What is meant by energy-efficient design?	1	Remember
16.	What is Design for Recycling (DFR)?	1	Remember
17.	State two objectives of Design for Recycling.	2	Understand
18.	Why is material compatibility important in recycling?	2	Understand
19.	How does Design for Recycling reduce landfill waste?	2	Understand
20.	Mention two benefits of Design for Recycling.	1	Remember
21.	How are environmental damage and inefficient energy use related?	2	Understand
22.	What role does green manufacturing play in environmental protection?	1	Remember
23.	How does recycling support sustainable manufacturing?	2	Understand
24.	What is meant by end-of-life consideration in product design?	1	Remember
25.	How does green manufacturing contribute to sustainable development?	2	Understand
PART B			
1.	Explain the environmental effects of engineering design decisions throughout the product life cycle.	3	Apply
2.	Discuss how design choices influence resource consumption and environmental sustainability.	3	Apply
3.	Explain the role of product design in controlling environmental pollution.	3	Apply
4.	Analyze the relationship between design practices and the environmental performance of products.	4	Analyze
5.	Explain the various types of environmental damage caused by manufacturing industries.	3	Apply
6.	Discuss the causes and consequences of environmental damage due to improper design.	3	Apply
7.	Explain how environmental damage affects ecological balance and human health.	3	Apply
8.	Discuss the need for environmentally responsible design to prevent environmental degradation.	3	Apply
9.	i. What is composite and how it is manufactured? (6) ii. Compare wet and dry manufacturing process. (7)	4	Analyze
10.	Analyze the importance of energy efficiency in achieving sustainable manufacturing.	4	Analyze

11.	Explain in detail about the features of green manufacturing.	3	Apply
12.	Discuss the environmental and economic impacts of inefficient energy utilization.	3	Apply
13.	What is air pollution? How air is polluted due to industries? Suggest practical measures to minimize the same.	3	Apply
14.	Explain the concept and objectives of Design for Recycling in green manufacturing.	4	Analyze
15.	Describe the principles and guidelines of Design for Recycling.	4	Analyze
16.	Explain how Design for Recycling reduces waste generation and resource depletion.	4	Analyze
17.	Discuss the challenges involved in implementing Design for Recycling in manufacturing industries.	3	Apply
18.	List out different types of recycling.	3	Apply
	PART C		
1.	Explain green manufacturing in detail with a case study.	3	Apply
2.	Explain the Factors affecting the machining process sustainability and their desired levels with example.	4	Analyze
3.	Write the organization setup of maintenance department in a large plant. How does it differ from that in a small plant manufacturing same product?	4	Analyze
4.	Explain in detail the three safeguard measures used to address environmental impacts.	3	Apply
5.	What are the different types of solid waste disposal you know? What are the positive and negative impact to the society?	3	Apply

UNIT II - ENVIRONMENTAL LIFE CYCLE ASSESSMENT			
Material flow and cycles – Material recycling – Emission less manufacturing.			
PART A			
Q.NO	**QUESTIONS**	**BT LEVEL**	**COMPETENCE**
1.	What is meant by material flow in Environmental Life Cycle Assessment (LCA)?	1	Remember
2.	Define the material cycle in sustainable manufacturing.	1	Remember
3.	What is material flow analysis (MFA)?	1	Remember
4.	Mention any two stages of material flow in a product life cycle.	1	Remember
5.	What is the difference between open-loop and closed-loop material cycles?	1	Remember
6.	How do material cycles contribute to resource conservation?	2	Undestand
7.	What is meant by circular material flow?	1	Remember
8.	Define material recycling.	1	Remember
9.	What are the main objectives of material recycling?	1	Remember
10.	Mention two benefits of recycling from an environmental perspective.	2	Understand
11.	What is primary recycling?	1	Remember
12.	What is secondary recycling?	1	Remember
13.	Why is recycling important in life cycle assessment?	2	Understand
14.	Mention any two challenges associated with material recycling.	1	Remember
15.	How does material recycling reduce energy consumption?	2	Understand
16.	What is meant by emission-less manufacturing?	2	Understand
17.	State the objective of emission-less manufacturing.	2	Understand
18.	Mention two methods used to achieve emission-less manufacturing.	1	Remember
19.	How does emission-less manufacturing support environmental sustainability?	2	Understand
20.	What role does cleaner production play in emission-less manufacturing?	1	Remember
21.	How does emission-less manufacturing reduce pollution?	2	Understand

22.	Mention two benefits of emission-less manufacturing to industries.	1	Remember
23.	How does material flow analysis support emission less manufacturing?	2	Understand
24.	What is the role of recycling in reducing environmental impact over a product life cycle?	1	Remember
25.	How does Environmental Life Cycle Assessment help in sustainable manufacturing decisions?	2	Understand
	PART B		
1.	Explain in detail about the factors affecting energy use in manufacturing.	3	Apply
2.	Describe the different stages of material flow in a product life cycle and explain their environmental significance.	4	Analyze
3.	Explain the role of closed-loop and open-loop material cycles in sustainable manufacturing systems.	3	Apply
4.	Explain the process of sustainable material flow management.	4	Analyze
5.	Describe the recycling process for metallic and non-metallic materials and explain their impact on environmental performance.	4	Analyze
6.	Write about some sustainable manufacturing materials.	3	Apply
7.	Explain the role of recycling in reducing energy consumption and greenhouse gas emissions.	3	Apply
8.	State the properties of eco-friendly manufacturing materials.	3	Apply
9.	Write down the benefits and barriers of using recycled materials.	3	Apply
10.	Explain the process of reusing metal scraps.	3	Apply
11.	Enumerate the factors affecting the selection of material handling equipment in a production shop.	4	Analyze
12.	Describe the methods adopted to achieve emission-less manufacturing in mechanical industries.	3	Apply
13.	Compare conventional manufacturing and emission-less manufacturing with respect to energy consumption, emissions, cost, and environmental impact.	4	Analyze
14.	With a neat block diagram, explain the framework of an emission less manufacturing system.	3	Apply
15.	Explain the purpose of product design. State the requirements of	4	Analyze

	good design.		
16.	Explain the concept of Product Development. Discuss the various needs of product development in an industry and its role in achieving sustainable growth.	3	Apply
17.	What are the various types of emission-less manufacturing? Discuss in detail.	3	Apply
18.	Describe the role of renewable energy sources and energy management systems in achieving emission-less manufacturing in mechanical industries	3	Apply
PART C			
1.	Explain in detail about sustainable manufacturing materials.	3	Apply
2.	Explain Environmental Life Cycle Assessment and discuss the role of material flow, recycling, and emission-less manufacturing in reducing environmental impact.	3	Apply
3.	A mechanical manufacturing unit aims to achieve near-zero emissions. Propose a systematic approach that incorporates process modifications, waste recovery, and energy optimization.	4	Analyze
4.	Explain the procedural approach to be adopted for analysis of handling problems and the development of low cost material handling systems.	4	Analyze
5.	Explain the interrelationship between material cycles, recycling, and emission-less manufacturing in achieving sustainable development.	3	Apply

UNIT III - GREEN DESIGN METHODS			
Mass balance analysis – Green indicate – Design for disassembly, design for recycle – Risk analysis – Material selection.			
PART A			
Q.NO	**QUESTIONS**	**BT LEVEL**	**COMPETENCE**
1.	What is meant by mass balance analysis in green design?	1	Remember
2.	State the basic principle of mass balance analysis.	2	Understand
3.	What are the main inputs considered in a mass balance study?	1	Remember
4.	How does mass balance analysis help in waste reduction?	2	Understand
5.	Mention any two applications of mass balance analysis in manufacturing.	1	Remember
6.	What is a green indicator?	1	Remember
7.	State the purpose of using green indicators in product design.	2	Understand
8.	List any two examples of green indicators.	1	Remember
9.	How do green indicators support sustainable decision-making?	2	Understand
10.	What is the advantage of using quantitative green indicators?	1	Remember
11.	What is Design for Disassembly?	1	Remember
12.	Mention any two objectives of Design for Disassembly.	1	Remember
13.	How does fastener selection affect disassembly?	2	Understand
14.	State two benefits of Design for Disassembly at end-of-life stage.	2	Understand
15.	What is meant by disassembly sequence planning?	1	Remember
16.	What is Design for Recycling?	1	Remember
17.	Mention two principles of Design for Recycling.	1	Remember
18.	Why is material compatibility important in recycling?	2	Understand
19.	How does Design for Recycling reduce environmental impact?	2	Understand
20.	What is meant by closed-loop recycling?	1	Remember
21.	What is risk analysis in green design?	2	Understand
22.	State the purpose of environmental risk analysis.	2	Understand
23.	What is meant by risk identification?	1	Remember
24.	How does risk analysis help in preventing environmental hazards?	2	Understand

25.	Mention one benefit of risk analysis in sustainable product design.	1	Remember
	PART B		
1.	Explain Mass Balance Analysis as a green design method. Describe its procedure, significance, and applications in sustainable product design.	3	Apply
2.	Describe the step-by-step procedure involved in performing a mass balance for a manufacturing process.	3	Apply
3.	With a neat block diagram, explain the flow of materials in a Mass Balance Analysis for a mechanical product	3	Apply
4.	Explain different types of green indicators used in design and discuss about evaluating the environmental performance of products.	4	Analyze
5.	Explain the concept of Design for Disassembly (DFD). Discuss its principles, methodology, and advantages with suitable examples.	4	Analyze
6.	Explain Risk Analysis in green design.	3	Apply
7.	Describe in detail about the role of material selection in green design.	3	Apply
8.	Describe the steps involved in environmental risk analysis and its importance in sustainable manufacturing.	3	Apply
9.	Explain in detail about the criteria for material selection in green design. Explain how embodied energy and environmental impact influence material choice	3	Apply
10	Discuss the role of risk analysis in preventing environmental hazards during the life cycle of a mechanical product.	4	Analyze
11	Explain the criteria and tools used for selecting environmentally friendly materials.	3	Apply
12	Explain the importance of Mass Balance Analysis in reducing waste generation and improving resource efficiency in mechanical industries	4	Analyze
13	Explain how Design for Disassembly supports maintenance, remanufacturing, and product upgrading.	3	Apply
14.	Explain how material separation techniques influence recycling efficiency in mechanical product design.	4	Analyze
15.	Discuss how material properties influence environmental	4	Analyze

	performance throughout the product life cycle.		
16.	Explain the concept of eco-material design. How does it differ from conventional material selection?	3	Apply
17.	Explain how Design for Disassembly improves component reuse and remanufacturing potential.	4	Analyze
18.	Explain how design simplification enhances recycling efficiency in mechanical products.	4	Analyze
PART C			
1.	Discuss the role of surface coatings and composite materials in Design for Recycling.	3	Apply
2.	Analyze the challenges faced in recycling multi-material products and how DFR addresses these challenges.	4	Analyze
3.	Explain the economic benefits of implementing Design for Disassembly in large-scale manufacturing industries.	3	Apply
4.	Explain how material toxicity and recyclability affect material design decisions in green engineering.	3	Apply
5.	Discuss the challenges involved in implementing green material design in industrial applications.	3	Apply

UNIT IV - DESIGN FOR ENVIRONMENT			
Eco design – Industrial Ecology – Pollution prevention – Reduction of toxic emission.			
PART A			
Q.NO	**QUESTIONS**	**BT LEVEL**	**COMPETENCE**
1.	What is meant by Eco Design?	1	Remember
2.	State the main objective of Eco Design.	2	Understand
3.	How does Eco Design differ from conventional product design?	2	Understand
4.	Mention any two benefits of Eco Design.	1	Remember
5.	What is meant by life-cycle thinking in Eco Design?	1	Remember
6.	List any two principles of Eco Design.	1	Remember
7.	Define Industrial Ecology.	1	Remember
8.	What is meant by an industrial ecosystem?	1	Remember
9.	How does Industrial Ecology promote resource efficiency?	2	Understand
10.	What is industrial symbiosis?	1	Remember
11.	Mention one example of industrial symbiosis.	1	Remember
12.	How does Industrial Ecology support sustainable development?	2	Understand
13.	What is meant by pollution prevention?	1	Remember
14.	How is pollution prevention different from pollution control?	2	Understand
15.	Mention any two pollution prevention techniques.	1	Remember
16.	What role does process modification play in pollution prevention?	1	Remember
17.	How does pollution prevention reduce environmental impact?	2	Understand
18.	What are toxic emissions?	1	Remember
19.	Why is reduction of toxic emissions important?	2	Understand
20.	Mention any two sources of toxic emissions in industries.	1	Remember
21.	What methods are used to reduce toxic emissions at source?	1	Remember
22.	How does material substitution help in reducing toxic emissions?	2	Understand
23.	What is meant by green chemistry in emission reduction?	1	Remember
24.	How does Eco Design contribute to pollution prevention?	2	Understand
25.	How does Design for the Environment help in reducing toxic emissions?	2	Understand

PART B			
1.	Explain the concept of Eco Design. Discuss its objectives and importance in sustainable product development.	3	Apply
2.	Describe the principles of Eco Design and explain how life-cycle thinking is incorporated into product design.	3	Apply
3.	Explain the role of Eco Design in reducing environmental impact during manufacturing, usage, and disposal stages.	4	Analyze
4.	Discuss the challenges involved in implementing Eco Design in mechanical engineering industries.	3	Apply
5.	Explain the concept of Industrial Ecology. How does it differ from traditional industrial systems?	3	Apply
6.	Describe the structure of an industrial ecosystem and explain its significance in sustainable manufacturing.	3	Apply
7.	Explain the concept of industrial symbiosis with suitable examples. Discuss its environmental benefits.	3	Apply
8.	Discuss the role of Industrial Ecology in efficient resource utilization and waste minimization.	3	Apply
9.	Explain pollution prevention strategies used in manufacturing industries. How do they differ from pollution control methods?	4	Analyze
10.	Discuss the importance of pollution prevention in achieving sustainable industrial development.	3	Apply
11.	Explain how process modification and improved operational practices help in pollution prevention.	4	Analyze
12.	Describe the role of product and process redesign in preventing pollution at source.	3	Apply
13.	Discuss the role of Design for Environment (DfE) in reducing toxic emissions and achieving sustainable manufacturing	4	Analyze
14.	Explain the sources of toxic emissions in mechanical industries and discuss methods for their reduction.	3	Apply
15.	Describe the techniques used for reducing toxic emissions through material substitution and cleaner technologies.	3	Apply
16.	Explain the role of green chemistry and cleaner production in reducing toxic emissions.	3	Apply
17.	Discuss the environmental and health impacts of toxic emissions and the need for their reduction.	3	Apply

18.	Explain how Eco Design and Industrial Ecology together contribute to pollution prevention and emission reduction.	4	Analyze
	PART C		
1.	Explain the application of Eco Design principles in the automotive industry to reduce environmental impact throughout the vehicle life cycle.	3	Apply
2.	Describe how Design for Environment approaches are applied in consumer durable product manufacturing to reduce toxic emissions.	4	Analyze
3.	Explain the application of pollution prevention strategies in machining and metal forming industries.	3	Apply
4.	Discuss with a case study the Pollution prevention.	3	Apply
5.	Summarize with a case study the Reduction of toxic emissions.	3	Apply

UNIT V - SUSTAINABLE ECONOMIC ENVIRONMENT			
Solar energy devices – wind energy resources – Full cost accounting methodology – Selection of natural friendly materials.			
PART A			
Q.NO	**QUESTIONS**	**BT LEVEL**	**COMPETENCE**
1.	Define the term Solar energy	1	Remember
2.	Define energy.	1	Remember
3.	State the objectives of fibers used in green composites.	2	Understand
4.	Where are industrial green space important?	2	Understand
5.	Review the green road concept.	2	Understand
6.	Define wind energy.	1	Remember
7.	Distinguish between recycle and reuse.	2	Understand
8.	What are the benefits of wind energy?	1	Remember
9.	Categorize types of wind energy.	2	Understand
10.	What are the challenges faced by industries in sustainable energy management?	1	Remember
11.	Define green composites.	1	Remember
12.	Write about Full cost accounting.	1	Remember
13.	Distinguish between solar energy and wind energy.	2	Understand
14.	List out the steps involved in solid waste management.	1	Remember
15.	Why do we need green composites?	2	Understand
16.	Define green cover.	1	Remember
17.	State the objectives of solid waste management.	2	Understand
18.	What are major sources of solid waste?	1	Remember
19.	Give the solution for challenges faced in sustainable energy management.	1	Remember
20.	Write the impacts of unplanned accounting methodology.	1	Remember
21.	Define incineration.	1	Remember
22.	What is composting?	1	Remember
23.	Define solid waste management.	1	Remember

24.	State the objectives of sustainable natural friendly materials in green industries.	2	Understand
25.	Suggest some ways for generating natural friendly materials.	2	Understand
	PART B		
1.	Explain the factors influencing Solar energy devices.	3	Apply
2.	Describe different types of solar energy devices used for thermal and electrical energy generation.	3	Apply
3.	Explain the applications of solar energy devices in industrial and domestic sectors.	3	Apply
4.	Explain the lifecycle of green composites.	3	Apply
5.	Explain wind energy as a renewable resource. Discuss the factors affecting wind energy availability.	3	Apply
6.	Describe the working principle and components of a wind energy conversion system.	3	Apply
7.	Explain different types of wind turbines and their applications.	3	Apply
8.	Discuss the economic and environmental benefits of wind energy utilization.	3	Apply
9.	Explain the concept of Full Cost Accounting (FCA). Discuss its importance in sustainable economic planning	3	Apply
10.	Describe the steps involved in the Full Cost Accounting methodology.	3	Apply
11.	Explain how Full Cost Accounting differs from conventional cost accounting methods.	4	Analyze
12.	Discuss the role of Full Cost Accounting in evaluating environmental and social costs of projects.	4	Analyze
13.	Explain the criteria for selecting natural friendly materials in sustainable product design	3	Apply
14.	Discuss the economic and environmental benefits of using natural friendly materials	3	Apply
15.	Explain how life cycle assessment supports the selection of natural friendly materials	4	Analyze
16.	Discuss the challenges involved in adopting natural friendly materials in industrial applications.	4	Analyze
17.	Compare solar energy and wind energy as sustainable power sources with respect to working principle, applications,	4	Analyze

	advantages, and limitations.		
18.	Discuss the role of solar energy, wind energy, and natural friendly materials in achieving sustainable development goals.	4	Analyze
PART C			
1.	Explain how renewable energy resources and full cost accounting together support a sustainable economic environment.	3	Apply
2.	Compare different renewable energy resources (solar, wind, biomass, and hydro) with respect to resource availability and sustainability.	4	Analyze
3.	Analyze the Full cost accounting methodology in India.	4	Analyze
4.	Explain some simple natural friendly materials.	3	Apply
5.	State the recycling techniques for different natural friendly materials.	3	Apply