Reg No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)
B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APR/MAY 2025

Manufacturing Engineering
MF5072 SUSTAINABLE MANUFACTURING
(Regulation2019)

Time:3hrs Max.Marks: 100

CO1	Identify the opportunities for sustainable manufacturing practices in industries and organization.
CO2	Describe the various policies for sustainable manufacturing.
CO3	Implement lean principles to reduce industrial wastes
CO4	Look for selection of sustainable machinery with lower energy consumption.
CO5	Recognize hazardous management techniques and safe practices.

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q.No.	Questions	Marks	CO	BL
1	What are the three pillars of sustainability?	2	1	1
2	Name any four Sustainable Development Goals (SDGs) created by the United Nations (UN).	2	1	1
3	What is meant by sustainable product design?	2	2	2
4	Give any two examples for environmentally conscious design.	2	2	2
5	How Lean manufacturing supports Sustainable manufacturing?	2	3	2
6	Name few criteria for sustainable energy consumption.	2	3	2
7	Compare power generation cost using renewable and non-renewable sources.	2	4	1
8	State two primary reasons why understanding the energy consumption of different machinery is important for sustainable manufacturing.	2	4	1
9	Name two aspects that should be considered when determining the appropriate method for the collection and storage of hazardous waste in an industry.	2	5	1
10	State any two potential benefits for a company that implements an effective product take-back program.	2	5	1

PART- B (5 x 13 = 65 Marks)

Q.No.	Questions	Marks	CO	BL
11 (a)	Compare and contrast the following concepts: green manufacturing, eco-manufacturing, eco-machining, clean manufacturing, and sustainable manufacturing.	13	1	4
	OR			
11 (b)	Discuss the interconnectedness of legislative, societal, and economic factors in driving the adoption and implementation of sustainable manufacturing practices.	13	1	4

12 (a)	Analyse the importance of the following in the context of sustainable product design. a) waste and by-product management, b) supply chain challenges, c) end-of-life acceptance, and d) material selection e) design complexity	13	2	4
	OR			
12 (b)	Discuss how focusing on product functionality, serviceability, maintainability, and upgradability contributes to sustainability. Explain how these aspects can reduce resource consumption and waste generation over the long term.	13	2	4
13 (a)	i. Analyse how the principles of Lean Manufacturing can contribute to achieving green energy goals and reducing environmental pollution in manufacturing industries.	7	3	4
	ii. Discuss any 3 tools of Lean Manufacturing.	6	3	4
	OR			
13 (b)	i. Discuss the causes and consequences of environmental pollution arising from manufacturing industries.	7	3	4
	ii. Analyse the strategies to mitigate the climate change.	6	3	4
14 (a)	Analyse the factors that influence the selection of appropriate machinery and materials for sustainable manufacturing, considering their impact on energy consumption and resource utilization.	13	4	4
	OR			
14 (b)	i. Discuss about Green Logistics and its significance in Sustainable manufacturing.	7	4	4
	ii. Discuss about Reverse Logistics and its significance in Sustainable manufacturing.	6	4	4
15 (a)	Apply Life Cycle Assessment to a textile industry to identify environmental hotspots and suggest opportunities for improvement.	13	5	3
	OR			
15 (b)	How can the integration of Circular Design, Biomimicry, Lean Design, Inclusive Design, and Clean Design principles contribute to the creation of sustainable jobs and economic growth.	13	5	3

PART – C (1 x 15 = 15 Marks)
(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.	Evaluate the challenges and opportunities inherent in developing and implementing comprehensive training programs for the Next Generation Workforce in Sustainable Manufacturing. Evaluate the strategic importance of such training initiatives in fostering a globally competitive and environmentally responsible manufacturing sector.	15	5	5