Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech (Full Time) - END SEMESTER EXAMINATIONS, APRIL/MAY 2025

B.E. Manufacturing Engineering

Semester VIII

MF5008 FLEXIBLE MANUFACTURING SYSTEMS
(Regulations 2019)

Time: 3 hrs | Max.Marks: 100

CO1	Analyse benefits, flexibility types, and applications of Flexible Manufacturing Systems (FMS). Remember and explore the potential of Knowledge-Based Scheduling for optimizing FMS operations.
CO2	Understand the use of hierarchical computer control in FMS, analyzing its role in work center and assembly iine management. Evaluate supervisory computer functions and software selection for FMS
CO3	Apply simulation techniques to model and Analyse FMS behavior. Understand data flow and design effective FMS database systems.
CO4	Analyse data and identify part families using Group Technology (GT) methods. Evaluate economic justification and feasibility of FMS implementation.
CO5	Apply FMS design and implementation knowledge to diverse applications. Create conceptual designs for future factories using FMS principles, AI, and Expert Systems.

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 is a Flexible Manufacturing System (FMS)? List any two objectives and merits of it.	**2**	1	L2
2	Differentiate between single-product and n-product FMS.	**2**	1	L2
3	What is the function of the supervisory computer and cell controller in an FMS?	**2**	2	L2
4	Mention challenges and risks involved in selecting off-the-shelf vs. customized software solutions for FMS.	**2**	2	L2
5	Define the term "model" in the context of FMS simulation. List any two limitations of simulation.	**2**	3	L2
6	Mention two software tools used for database management in manufacturing.	**2**	3	L2
7	How is the machine-component incidence matrix used in forming manufacturing cells?	**2**	4	L3
8	State the difference between deterministic and possibility-based models in FMS.	**2**	4	L2
9	How does FMS support mass customization?	**2**	5	L2
10	Mention the role of machine learning in predictive maintenance within an FMS.	**2**	5	L2

PART- B (5 x 13 = 65 Marks)

Q.No	Questions	Marks	CO	BL
11 (a)	Enumerate the various elements and lay out configurations in flexible manufacturing system.	13	1	L3
	OR			
11 (b)	Classify and compile the different levels of flexibility and types of FMS with suitable examples and advantages.	13	1	L3
12 (a)	Analyze the role of computer in control of work center, assembly lines and its interaction with other FMS components.	13	2	L3
	OR			
12 (b)	Discuss about the software systems, system-level issues and various types of software and its selection while implementing for flexible manufacturing system network with a simple case study.	13	2	L3
13 (a)	Illustrate the application of simulation software in scheduling and layout planning in FMS with a case study of your choice.	13	3	L3
	OR			
13 (b)	Discuss the structure and flow of manufacturing data in an integrated data system and steps involved in planning a database system for a mid-size FMS.	13	3	L3
14 (a)	Enumerate the graphical model of FMS and analyze how shortest path algorithms can be applied using graph formulation in material handling systems.	13	4	L3
	OR			
14 (b)	Analyze how fuzzy logic-based possibility distributions enhance flexibility in FMS decision-making under uncertainty with a case study.	13	4	L3
15 (a)	Describe the concept of FMS and apply it to optimize sheet metal fabrication with high variety and low volume.	13	5	L2
	OR			
15 (b)	Explain how the concept of "Factories of the Future" builds on FMS foundations and Apply design thinking to develop a future-ready FMS layout.	13	5	L2

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q.No	Questions	Marks	CO	BL
16.	Design a smart Flexible Manufacturing System that integrates digital twin technology and real-time AI-based decision support to enhance adaptability, efficiency, and predictive maintenance in aerospace component production. Analyze the suitability of designed FMS for aerospace component manufacturing and justify how it supports tight tolerances and advanced material machining in aerospace industries.	15	5	L5