Name:	
Enrolment No:	

UPES
End Semester Examination, May 2025

Course:	**CAD and Digital Manufacturing**	**Semester:**	**VI**
Program:	**Mechanical Engineering**	**Time:**	**03 hrs.**
Course Code:	**MECH 3050P**	**Max. Marks:**	**100**

Instructions: Attempt all questions. One question from section C has an internal Choice. Assume any missing data if required.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Define Product Lifecycle Management (PLM). List any three advantages of PLM in product development.	4	CO1
Q 2	Differentiate between parametric and direct modeling in 3D CAD.	4	CO2
Q 3	Explain the significance of meshing in FEM with suitable case study.	4	CO2
Q 4	Explain the advantages of virtual prototyping over traditional prototyping methods.	4	CO2
Q 5	Define Configuration Space (C-Space) and its relevance in robot motion planning.	4	CO1

SECTION B
(4Qx10M= 40 Marks)

Q 6	With a neat diagram, explain the various stages of the design process. Illustrate how CAD is integrated into each stage.	10	CO1
Q 7	Describe the methodology and applications of Reverse Engineering in digital manufacturing.	10	CO3
Q 8	(a) Explain Computer Integrated Manufacturing (CIM). Discuss its architecture with a neat diagram. (b) List and explain four major challenges in implementing CIM in an industrial setup.	10	CO2
Q 9	Explain the concept of Design for Manufacturing and Assembly (DFMA) and describe the Boothroyd and Dewhurst principles.	6+4	CO3

SECTION-C
(2Qx20M=40 Marks)

Q 10	(a) Describe the complete framework of Digital Manufacturing with schematic representation. (b) Explain the present scenario of smart manufacturing. How do technologies like IoT and AI influence the digital manufacturing ecosystem?	10 + 10	CO2

Q 11	(a) Explain the Finite Element Method (FEM) with a focus on its stages: preprocessing, processing, and postprocessing. Choose an example and outline the procedure. (b) Why is the use of triangular (tria) elements restricted in FEM? Explain with illustrations. (c) Mention three guidelines to be followed when using beam elements in structural analysis.	**10+5+5**	**CO3**
	OR (a) Explain the concept and theoretical framework of Virtual Manufacturing. How does it differ from Virtual Prototyping? Discuss the benefits of adopting Virtual Manufacturing in product development. (b) Describe the Configuration Space (C-Space) and Screw Space methodologies. How are these concepts applied in robotic path planning and digital manufacturing systems?	**10+10**	