BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER: V/ADD**
BRANCH: PRODUCTION AND INDUSTRIAL ENGINEERING **SESSION: MO/2025**

SUBJECT: PE318 RAPID PROTOTYPING AND TOOLING

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions, each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have the correct question paper.**
5. Tables/Data handbook/Graph paper, etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Critically evaluate and compare the virtual prototype and the physical prototype. Support your evaluation with relevant examples from industrial products	[5]	1	2,3,4,5
Q.1(b)	Analyze and compare the overall manufacturing costs of producing a ball bearing using conventional machining methods and additive manufacturing techniques. Based on your analysis, justify which process you would select and explain the rationale behind your decision.	[5]	1	3,4,5
Q.2(a)	With the help of a well-labeled schematic diagram, explain the working principle of the Selective Laser Sintering (SLS) process. Identify the materials commonly used in SLS.	[5]		3,4,
Q.2(b)	Examine the key differences between conventional tooling and rapid tooling and evaluate their respective advantages and limitations for modern manufacturing applications.	[5]		3,4
Q.3	Analyze the functional architecture of a Fused Deposition Modeling (FDM) system. Using a well-labelled schematic, evaluate the role of sensors, actuators, and control systems in ensuring precise prototype fabrication.	[10]		3,5
Q.4(a)	Analyze the concept and design principles of lattice structures in additive manufacturing. Evaluate how lattice structures enhance mechanical performance, material efficiency, and functional properties of components.	[5]		3,4,5
Q.4(b)	What is part orientation, and how does it influence the manufacturing of products in Rapid Prototyping (RP)?	[5]		3,4,5
Q.5	Evaluate the necessity of post-processing in products manufactured through various Additive Manufacturing processes. Identify and justify the selection of key post-processing techniques with appropriate examples of products fabricated using an Additive Manufacturing route.	[10]	5	4,5

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