Register Number:……..

B.E DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2018)

Fifth Semester

AERONAUTICAL ENGINEERING

U18AEE0018: Additive Manufacturing and Tooling

COURSE OUTCOMES

CO1: Explain the principles of additive manufacturing (AM) and distinguish it from traditional manufacturing methods.

CO2: Define reverse engineering and articulate its purpose, methods, and applications across various industries.

CO3: Select appropriate additive manufacturing processes for specific applications and optimize parameters for desired outcomes.

CO4: Demonstration of software tools used for AM process planning, simulation, and model preparation.

CO5: Identify and differentiate between various sintering-based additive manufacturing techniques.

CO6: Comprehend the role of tooling in manufacturing and how additive manufacturing (AM) can transform traditional tooling practices.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1.	What is additive manufacturing, and how does it differ from traditional manufacturing methods?	CO1	[K_2]
2.	How are additive manufacturing processes classified?	CO1	[K_1]
3.	State the main objectives of reverse engineering a product or system.	CO2	[K_2]
4.	What are the main components of an additive manufacturing system?	CO3	[K_1]
5.	How would you select the appropriate additive manufacturing process for a specific application?	CO3	[K_2]
6.	List the factors influencing the quality and accuracy of parts produced through additive manufacturing.	CO4	[K_2]
7.	How do SLS and LENS differ regarding material usage and processing methods?	CO5	[K_2]
8.	What are the advantages of using SLS compared to other additive manufacturing techniques?	CO5	[K_2]
9.	Name some common types of tools produced through additive manufacturing.	CO6	[K_1]
10.	Differentiate between direct tooling and indirect tooling in additive manufacturing.	CO6	[K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.		Describe the entire additive manufacturing process chain, from initial concept to final part production, including all necessary steps and their significance. Discuss how each step contributes to the overall efficiency, quality, and cost-effectiveness of the final product. Specifically, address the following components: i. Design and Preparation ii. Slicing and Tool path generation iii. Material selection iv. Build process v. Post-process	16	CO1	[K_5]
12.	a)	Describe the step-by-step process of reverse engineering a mechanical component. What tools and technologies are typically used at each stage?	8	CO2	[K_3]
	b)	Name the most widely used file formats for 3D printing, and what are the specific advantages and limitations of each format?	8	CO2	[K_3]
13.		Explain how FDM works in additive manufacturing with a neat sketch? How would you set up an FDM printer to print a simple cube? Compare the advantages and disadvantages of using FDM compared to other 3D printing technologies like SLA or SLS.	16	CO3	[K_4]
14.		What are some common software tools used in Additive Manufacturing? With suitable example design a workflow integrating various software tools for a specific AM project, detailing each step and the software used.	16	CO4	[K_6]
15.		With a neat sketch, describe the SLS process in detail. Identify the advantages and disadvantages and evaluate the types of applications best suited for SLS.	16	CO5	[K_5]
16.	a)	What is the primary function of bridge and production tooling in additive manufacturing? How do bridge tools differ from production tools in terms of	8	CO6	[K_4]

design and application?

b)	Provide examples of industries that successfully utilize bridge tooling in their AM processes? What lessons can be learned from case studies where bridge tooling improved production efficiency or product quality?	8	CO6	[K_5]

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