Register Number:……..

B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2018)

Seventh Semester

MECHATRONICS ENGINEERING

U18MCE0010**:** Additive Manufacturing

COURSE OUTCOMES

CO1: Recognize the development of AM technology and how AM technology propagated into various businesses and developing opportunities.
CO2: Acquire knowledge on process of transforming a concept into the final product in AM technology.
CO3: Elaborate the vat polymerization and material extrusion processes and its applications.
CO4: Acquire knowledge on powder bed fusion processes and its applications.
CO5: Acquire knowledge on direct energy deposition processes and its applications.
CO6: Evaluate the advantages, limitations, applications of binder jetting, material jetting and laminated object manufacturing processes.

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

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Define the term “Additive Manufacturing”.	CO1	[K_1]
2.	Differentiate between direct tooling and indirect tooling.	CO1	[K_2]
3.	How does part orientation affect additive manufacturing?	CO2	[K_2]
4.	Mention the importance of topology optimization in DFAM.	CO2	[K_2]
5.	List out the common applications of Stereolithography.	CO3	[K_2]
6.	Name some materials commonly used in Fused deposition modeling (FDM).	CO3	[K_2]
7.	Why is post-processing often required in Powder Bed Fusion process?	CO4	[K_2]
8.	Write down the limitations of direct metal deposition process.	CO5	[K_2]
9.	Illustrate how material jetting forms 3D objects.	CO6	[K_2]
10.	Describe the working principle of Laminated Object Manufacturing (LOM).	CO6	[K_2]

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

11.	a)	Explain the evolution of additive manufacturing technology from rapid prototyping to rapid manufacturing, and how this transition has influenced its current role in industry.	8	CO1	[K_2]

	b)	Discuss how additive manufacturing supports the design of lightweight structures and the implications for industries such as aerospace and automotive.	8	CO2	[K_2]
12.	a)	Evaluate the challenges and limitations of bioprinting in creating functional human tissues and organs.	8	CO1	[K_3]
	b)	Analyze the role of part orientation in additive manufacturing and its effects on print quality, mechanical properties, and material usage.	8	CO2	[K_3]
13.	a)	Explain the photopolymerization process in Stereolithography Apparatus (SLA) and how it is used to create 3D objects.	8	CO3	[K_2]
	b)	Analyze the powder fusion mechanism in Selective Laser Sintering (SLS) and its significance in the formation of solid parts.	8	CO4	[K_3]
14.	a)	Discuss the applications of Fused Deposition Modeling (FDM) and how the technology is used in different industries.	8	CO3	[K_2]
	b)	Justify the continued development and adoption of Electron Beam Melting (EBM) for high-performance applications in industries like aerospace and healthcare.	8	CO4	[K_2]
15.	a)	Explain the Laser Engineered Net Shaping (LENS) process and how it is used in additive manufacturing to produce metal parts.	8	CO5	[K_2]
	b)	Discuss the Material Jetting process, specifically Multijet Modeling (MJM), and its benefits and limitations for additive manufacturing.	8	CO6	[K_2]
16.	a)	Evaluate the materials commonly used in Laser Engineered Net Shaping (LENS) and their suitability for various applications.	8	CO5	[K_3]
	b)	Explain the basic principles of the Sheet Lamination process, specifically focusing on Laminated Object Manufacturing (LOM), and describe its mechanisms, including gluing/adhesive bonding and thermal bonding.	8	CO6	[K_2]

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