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	ii.	Discuss the principles, advantages, and limitations of Wire Arc Additive Manufacturing (WAAM) in detail. Draw the schematic diagram of the WAAM setup.	6	3	4	1,3,5 10,12	1,3
OR	iii.	Differentiate between DED and power bed AM process.	6	2	4	1,3,5 10,12	1,3
Q.6		Attempt any two:					
	i.	What is the purpose of post-processing in additive manufacturing? Provide a brief explanation of two common post-processing techniques and their applications.	5	2	5	1,3,5 10,12	1,3
	ii.	Explain the concept of defects in additive manufacturing. List three common types of defects that can occur in 3D printed parts. Explain with diagram.	5	2	5	1,3,5 10,12	1,3
	iii.	Discuss about various in-situ and ex-situ techniques.	5	2	5	1,3,5 10,12	1,3

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Total No. of Questions: 6

Total No. of Printed Pages:4

Enrollment No.....



Faculty of Engineering  
End Sem Examination Dec 2024  
ME3EL25 Additive Manufacturing

Programme: B.Tech.

Branch/Specialisation: ME

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

		Marks	BL	CO	PO	PSO
Q.1	i.	What is the main difference between Additive Manufacturing (AM) and traditional manufacturing processes?	1	1	1	1,3,5 10,12
	(a)	AM subtracts material from a workpiece				
	(b)	AM builds objects layer by layer				
	(c)	AM only uses metals				
	(d)	AM is not used for prototypes				
	ii.	Which of the following is a key application of Additive Manufacturing in product development?	1	1	1	1,3,5 10,12
	(a)	Mass production of identical parts				
	(b)	Prototyping and rapid iterations				
	(c)	Traditional tooling processes				
	(d)	Assembly line automation				
	iii.	Stereolithography (SLA) is an example of which type of AM technology?	1	2	2	1,3,5 10,12
	(a)	Powder-based				
	(b)	Liquid-based				
	(c)	Solid-based				
	(d)	Electron beam-based				
	iv.	What is the primary material used in Fused Deposition Modeling (FDM) for creating objects?	1	1	2	1,3,5 10,12
	(a)	Metal powders				
	(b)	Liquid resin				
	(c)	Thermoplastic filament				
	(d)	Ceramic particles				

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v.	Selective Laser Sintering (SLS) is most commonly used for which type of material? (a) Plastics (b) Metals (c) Ceramics (d) Rubber	1	2	3	1,3,5 10,12	1,3
vi.	Which additive manufacturing process is often used for creating intricate sand molds for casting metal parts? (a) Direct Metal Laser Sintering (DMLS) (b) Laminated Object Manufacturing (LOM) (c) Selective Laser Melting (SLM) (d) Binder Jetting	1	2	3	1,3,5 10,12	1,3
vii.	In electron beam freedom fabrication, what type of energy source is utilized for material deposition? (a) Laser (b) Electron beam (c) Ultrasonic waves (d) Heat gun	1	1	4	1,3,5 10,12	1,3
viii.	Wire Arc Additive Manufacturing (WAAM) primarily uses which type of material? (a) Metal wire (b) Liquid resin (c) Ceramic powder (d) Plastic filament	1	1	4	1,3,5 10,12	1,3
ix.	What is the primary goal of post-processing in additive manufacturing? (a) Adding more layers to the object (b) Enhancing the appearance of the object (c) Improving the part's final properties (d) Removing layers from the object	1	1	5	1,3,5 10,12	1,3
x.	What is the basic function of friction stir welding tool in Friction Stir Additive Manufacturing (FSAM)? (a) Layer by layer deposition (b) Laser cutting (c) Joining and bending material (d) Material removal	1	3	5	1,3,5 10,12	1,3

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Q.2	i.	Explain the key differences between subtractive and additive manufacturing processes.	2	2	1	1,3,5 10,12	1,3
	ii.	Provide a brief history of additive manufacturing and its significance in modern product development.	3	1	1	1,3,5 10,12	1,3
	iii.	Compare and contrast AM technology and reverse engineering, highlighting their respective applications.	5	3	1	1,3,5 10,12	1,3
OR	iv.	Explain the advantage of reverse engineering. Describe the different materials used in additive manufacturing and their applications in various domains.	5	2	1	1,3,5 10,12	1,3
Q.3	i.	Define stereolithography and explain its principles. Provide examples of its applications.	2	1	2	1,3,5 10,12	1,3
	ii.	Discuss the principles and working of Fused Deposition Modeling (FDM) and its advantages. Explain with schematic diagram.	8	3	2	1,3,5 10,12	1,3
OR	iii.	Compare LOM and FDM process used in additive manufacturing. Also discuss the practical application and types of material used in both the process.	8	2	2	1,3,5 10,12	1,3
Q.4	i.	What are the key advantages of Electron Beam Melting (EBM) technology in powder-based additive manufacturing? Explain with schematic diagram.	3	2	3	1,3,5 10,12	1,3
	ii.	Describe the working principles and advantages of Direct Metal Laser Sintering (DMLS) process. Explain with schematic diagram.	7	3	3	1,3,5 10,12	1,3
OR	iii.	Compare and contrast the powder-based AM systems i.e. SLS, DMLS, SLM. Also include the applications.	7	1	3	1,3,5 10,12	1,3
Q.5	i.	Write any four advantages of electron beam freedom fabrication principles.	4	1	4	1,3,5 10,12	1,3

**Marking Scheme**  
**ME3EL25 (T) Additive Manufacturing (T)**

Q.1	i)	b. AM builds objects layer by layer.	1
	ii)	b. Prototyping and rapid iterations	1
	iii)	b. Liquid-based	1
	iv)	c. Thermoplastic filament	1
	v)	a. Plastics	1
	vi)	d. Binder Jetting	1
	vii)	b. Electron beam	1
	viii)	a. Metal wire	1
	ix)	b. Enhancing the appearance of the object	1
	x)	a. layer by layer deposition	1
Q.2	i.	Explain the key differences between Subtractive and Additive Manufacturing processes. Principle -----1 Mark Material saving -----1 Mark	2
	ii.	Provide a brief history of Additive Manufacturing and its significance in modern product development History -----2 Marks Significance -----1 Mark	3
	iii.	Compare and contrast AM technology and Reverse Engineering, highlighting their respective applications. Principle -----2 Marks Comparison----- 2 Marks Application -----1 Mark	5
	OR iv.	Explain the advantage of Reverse Engineering. Describe the different materials used in Additive Manufacturing and their applications in various domains. Advantage of reverse engineering -----2 Marks Materials used in AM process -----2 Marks Application -----1 Mark	5
Q.3	i.	Define Stereolithography and explain its principles. Provide examples of its applications. Principle of stereolithography ----- 1 Mark Example /application -----1 Mark	2
	ii.	Discuss the principles and working of Fused Deposition Modeling	8

		(FDM) and its advantages. Explain with schematic diagram.	
		Principle of FDM -----2 Marks	
		Working of FDM -----2 Marks	
		Schematic Diagram -----2 Marks	
		Advantage -----2 Marks	
OR	iii.	Compare LOM and FDM process used in Additive manufacturing. Also discuss the practical application and types of material used in both the process.	8
		Principle of LOM and FDM -----3 Marks	
		Functional difference of LOM and FDM -----3 Marks	
		Material used -----1 Mark	
		Application -----1 Mark	
Q.4	i.	What are the key advantages of Electron Beam Melting (EBM) technology in powder-based additive manufacturing? Explain with schematic diagram.	3
		Advantage of EBM -----2 Marks	
		Schematic Diagram -----1 Mark	
	ii.	Describe the working principles and advantages of Direct Metal Laser Sintering (DMLS) process. Explain with schematic diagram.	7
		Working Principle of DMLS ----- 2 Marks	
		Advantages of DMLS -----3 Marks	
		Schematic Diagram -----2 Marks	
OR	iii.	Compare and contrast the powder-based AM systems i.e. SLS, DMLS, SLM. Also include the applications.	7
		Comparison on basis of Principle + Working ----- 2 Marks	
		Comparison on basis of Advantages-----2 Marks	
		Comparison on basis of Material -----2 Marks	
		Comparison on basis of Application -----1 Mark	
Q.5	i.	Write any four advantages of electron beam freedom fabrication principles.	4
		Four advantages of EBFF----- (1 mark each)	
	ii.	Discuss the principles, advantages, and limitations of Wire Arc Additive Manufacturing (WAAM) in detail. Draw the schematic diagram of the WAAM setup.	6
		Principle of WAAM ----- 2 Marks	
		Advantage of WAAM -----1 Mark	

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Schematic diagram -----2 Marks

Q.6

What is post processing ----- 1 Mark

ii. Explain the concept of defects in Additive Manufacturing. List three common types of defects that can occur in 3D printed parts. **5**

How defects are formed during AM ----- 2 Marks

Types of defects -----2 Marks

Sketch of defects -----1 Mark

iii. Discuss about various in-situ and ex-situ techniques. **5**

In-situ ----- 2.5 Marks

Ex-situ -----2.5 Marks

P.T.O.