

	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:	5	2	5	1,3,5 10,12	1,3
	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

*Total No. of Questions: 6**Total No. of Printed Pages: 4***Enrollment No.....**

Knowledge is Power

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
1	1	1	1,3,5 10,12	1,3
1	1	1	1,3,5 10,12	1,3
1	2	2	1,3,5 10,12	1,3
1	1	2	1,3,5 10,12	1,3

Q.1

- i. What is the main difference between Additive Manufacturing (AM) and traditional manufacturing processes?
 - (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?
 - (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?
 - (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?
 - (a) Metal powders
 - (b) Liquid resin
 - (c) Thermoplastic filament
 - (d) Ceramic particles

Marking Scheme

ME3EL25 (T) Additive Manufacturing (T)

Q.1	i) b. AM builds objects layer by layer.	1	<p>(FDM) and its advantages. Explain with schematic diagram.</p> <p>Principle of FDM ----- 2 Marks</p> <p>Working of FDM ----- 2 Marks</p> <p>Schematic Diagram ----- 2 Marks</p> <p>Advantage ----- 2 Marks</p> <p>OR</p> <p>iii. Compare LOM and FDM process used in Additive manufacturing. Also discuss the practical application and types of material used in both the process.</p> <p>Principle of LOM and FDM ----- 3 Marks</p> <p>Functional difference of LOM and FDM ----- 3 Marks</p> <p>Material used ----- 1 Mark</p> <p>Application ----- 1 Mark</p>	8
	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.	2	<p>Q.4 i. What are the key advantages of Electron Beam Melting (EBM) technology in powder-based additive manufacturing? Explain with schematic diagram.</p> <p>Advantage of EBM ----- 2 Marks</p> <p>Schematic Diagram ----- 1 Mark</p> <p>ii. Describe the working principles and advantages of Direct Metal Laser Sintering (DMLS) process. Explain with schematic diagram.</p> <p>Working Principle of DMLS ----- 2 Marks</p> <p>Advantages of DMLS ----- 3 Marks</p> <p>Schematic Diagram ----- 2 Marks</p> <p>OR</p> <p>iii. Compare and contrast the powder-based AM systems i.e. SLS, DMLS, SLM. Also include the applications.</p> <p>Comparison on basis of Principle + Working ----- 2 Marks</p> <p>Comparison on basis of Advantages----- 2 Marks</p> <p>Comparison on basis of Material ----- 2 Marks</p> <p>Comparison on basis of Application ----- 1 Mark</p>	3
	Principle ----- 1 Mark			
	Material saving ----- 1 Mark			
	ii. Provide a brief history of Additive Manufacturing and its significance in modern product development	3		
	History ----- 2 Marks			
	Significance ----- 1 Mark			
	iii. Compare and contrast AM technology and Reverse Engineering, highlighting their respective applications.	5		
	Principle ----- 2 Marks			
	Comparison----- 2 Marks			
	Application ----- 1 Mark			
OR	iv. Explain the advantage of Reverse Engineering. Describe the different materials used in Additive Manufacturing and their applications in various domains.	5	<p>Q.5 i. Write any four advantages of electron beam freedom fabrication principles.</p> <p>Four advantages of EBFF----- (1 mark each)</p> <p>ii. Discuss the principles, advantages, and limitations of Wire Arc Additive Manufacturing (WAAM) in detail. Draw the schematic diagram of the WAAM setup.</p> <p>Principle of WAAM ----- 2 Marks</p> <p>Advantage of WAAM ----- 1 Mark</p>	7
	Advantage of reverse engineering -----2 Marks			
	Materials used in AM process -----2 Marks			
	Application -----1 Mark			
Q.3	i. Define Stereolithography and explain its principles. Provide examples of its applications.	2	<p>Q.5 i. Write any four advantages of electron beam freedom fabrication principles.</p> <p>Four advantages of EBFF----- (1 mark each)</p> <p>ii. Discuss the principles, advantages, and limitations of Wire Arc Additive Manufacturing (WAAM) in detail. Draw the schematic diagram of the WAAM setup.</p> <p>Principle of WAAM ----- 2 Marks</p> <p>Advantage of WAAM ----- 1 Mark</p>	4
	Principle of stereolithography ----- 1 Mark			
	Example /application -----1 Mark			
	ii. Discuss the principles and working of Fused Deposition Modeling	8		

	[2]		[3]
	Limitation of WAAM -----1 Mark		
	Schematic diagram -----2 Marks		
OR iii.	Differentiate between DED and power bed AM process.	6	
	DED and power bed AM ----- 4 Marks		
	Three Difference -----2 Marks		

Q.6

- i. What is the purpose of post-processing in Additive Manufacturing? Provide a brief explanation of two common post-processing techniques and their applications.
What is post processing ----- 1 Mark
Post processing techniques -----4 Marks
- 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
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.
In-situ ----- 2.5 Marks
Ex-situ -----2.5 Marks
