



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

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COIMBATORE-641 035, TAMIL NADU



DEPARTMENT OF AUTOMOBILE ENGINEERING

19AUT303 - Additive Manufacturing and its Applications

IAE – 3 - Question Bank with Answers

2 Marks

1. Summarize the key aspects of LENS

- ✓ Versatile Materials
- ✓ High Precision and Resolution
- ✓ Repair and Fabrication
- ✓ Reduced Waste
- ✓ Applications in Various Industries

2. Clarify the process parameters involved in Binder Jet Technology

- ✓ Layer Thickness
- ✓ Printing Speed
- ✓ Drying and Curing
- ✓ Powder Spreading
- ✓ Build Orientation

3. Summarize Binder Jet Technology briefly in a few sentences

Binder Jet Technology is an additive manufacturing process that constructs 3D objects by selectively depositing a liquid binding agent onto a powder bed layer by layer. This method allows for the creation of complex structures using various materials such as metals, ceramics, or polymers.

4. Identify the materials commonly utilized in selective laser melting

- ✓ Stainless Steel
- ✓ Aluminum Alloys
- ✓ Titanium Alloys
- ✓ Nickel-Based Alloys
- ✓ Cobalt-Chromium Alloys
- ✓ Tool Steel Alloys
- ✓ Copper Alloys
- ✓ Precious Metals
- ✓ Refractory Alloys
- ✓ High-Performance Alloys

5. Assess between AM techniques that are based on solid and powder materials

Parameter	Solid based technique	Liquid based technique
Materials	Thermoplastic filaments (e.g., PLA, ABS)	Limited to thermoplastics
Build Speed	Faster build times compared to some powder-based techniques	Build times can be influenced by factors such as layer thickness, part complexity, and post-processing steps
Material Versatility	Limited to thermoplastics	Broader range of materials, including metals, ceramics, and polymers.
Cost	Cost-effective, easy to use, faster build times for certain applications	Equipment costs may be higher, powder handling considerations, potential post-processing steps

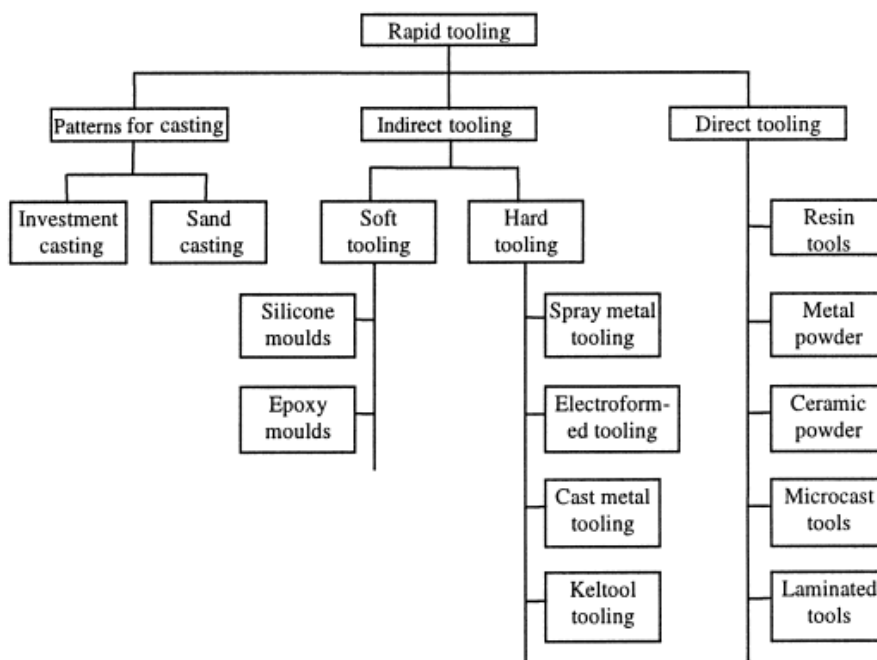
6. Explain whether support structures are required in selective laser sintering and under what circumstances they may be needed?

Selective laser sintering does not require support structures because unsintered powder surrounds the parts during printing. SLS printing can produce previously impossible complex geometries, such as interlocking or moving parts, parts with interior components or channels, and other highly complex designs.

7. How is Rapid Tooling applied in manufacturing processes?

Rapid Tooling plays a crucial role in streamlining the tooling development process, reducing lead times, and providing manufacturers with the flexibility to create customized tooling for specific applications

8. Categorize Rapid Tooling based on its key characteristics.



9. List and discuss specific applications of additive manufacturing within the aerospace industry.

Additive Manufacturing (AM) has found numerous applications within the aerospace industry, transforming traditional manufacturing processes and enabling the production of complex components with improved efficiency and performance.

- ✓ Aircraft Components
- ✓ Engine Components
- ✓ Spacecraft Components
- ✓ Airframe Structures
- ✓ Unmanned Aerial Vehicles

10. Provide examples of specific food products or components that can be manufactured using additive manufacturing techniques

- ✓ Chocolate Confections
- ✓ Sugar Decorations
- ✓ Pasta Shapes
- ✓ Candy and Gummies
- ✓ Customized Cookies
- ✓ Cheese Sculptures
- ✓ Vegetable and Fruit Shapes
- ✓ Personalized Nutritional Snacks
- ✓ Meat Alternatives
- ✓ Energy Bars and Protein Bars

14 Marks

- 1. Contain a comprehensive explanation of the Selective Laser Sintering (SLS) processes operation using the required diagrams**
Reference link:
<https://www.hubs.com/knowledge-base/what-is-sls-3d-printing/>
- 2. Elucidate the construction and operational principles of the Selective Laser Melting (SLM) technique**
Reference link:
<https://www.eplus3d.com/selective-laser-melting-technology.html>
- 3. Articulate the construction and operational principles of Binder Jet Technology**
Reference link:
<https://www.lboro.ac.uk/research/amrg/about/the7categoriesofadditivemanufacturing/binderjetting/#:~:text=The%20binder%20jetting%20process%20uses,build%20material%20in%20powder%20form>
- 4. Summarize the operation of Laser Engineered Net Shaping (LENS) by using suitable diagrams.**
Reference link:
https://materials-informatics-class-fall2015.github.io/MIC-LENS/2015/09/24/Intro_LENS/
- 5. With an appropriate case study, elaborate on the Laser Powder Bed Fusion Techniques process parameters, materials, and applications.**
Reference link:
<https://www.lboro.ac.uk/research/amrg/about/the7categoriesofadditivemanufacturing/powderbedfusion/#:~:text=Powder%20Bed%20Fusion%20%E2%80%93%20Step%20by%20Step&text=A%20laser%20fuses%20the%20first,the%20entire%20model%20is%20created>
- 6. Elaborate the process parameter, materials and applications of Laminated Object Manufacturing with a case study**
Reference link:
http://home.iitk.ac.in/~nsinha/Additive_Manufacturing%20II.pdf
- 7. Apply the idea of additive manufacturing to the field of manufacturing and comment on it using an appropriate case study**
Reference link:
<https://www.renishaw.com/en/additive-manufacturing-for-precision-manufacturing--44455>
- 8. Describe any two Direct Rapid Tooling techniques.**
Reference link:
<https://formlabs.com/asia/blog/rapid-tooling/>
- 9. Describe how additive manufacturing is used in the following fields.
(i) Medical, (ii) Automotive and (iii) Aerospace**
Reference link:
<https://www.stratasys.co.in/stratasysdirect/resources/articles/unstoppable-industries-using-additive-manufacturing/>
- 10. Apply the idea of additive manufacturing to the field of manufacturing and comment on it using an appropriate case study**
Reference link:
<https://www.voxeljet.com/additive-manufacturing/case-studies/architecture/3d-printing-for-sustainable-architecture/>