



# **SANSKRUTI COLLEGE OF ENGINEERING & TECHNOLOGY**

(Approved by AICTE, New Delhi & Affiliated to JNTUH.)

**Kondapur(V), Ghatkesar(M), Medchal(Dist)**



**Subject Name: Additive Manufacturing Technologies**

**Prepared by (Faculty (s) Name): S. Veerendra Prasad**

**Year and Sem, Department: IV year I Semester, Mechanical Engineering Department**



**Unit-I: Introduction**

**Important points / Definitions: (Minimum 15 to 20 points covering complete topics in that unit)**

1. Fundamentals of rapid prototyping
2. Advantages and Limitations of RP.
3. Classification of additive manufacturing technologies.
4. Rapid Prototyping information work flow.

**Short Questions (minimum 10 previous JNTUH Questions – Year to be mentioned)**

1. Define additive manufacturing.
2. What does input refers to in additive manufacturing.
3. What form of materials for AM systems can be classified as solid based? Name three such systems.
4. Many terms have been used to refer to AM. Discuss three of such terms and explain why they have been used in place of AM.
5. Despite the increase in relative complexity of products shape and form, project time has been kept relatively shorter. Why?

**Long Questions (minimum 10 previous JNTUH Questions – Year to be mentioned)**

1. Summarize RP information workflow
2. Classify Rapid Prototyping processes.
3. List out advantages and limitations of Additive Manufacturing.
4. Enumerate fundamentals of Rapid Prototyping.

**Fill in the Blanks / Choose the Best: (Minimum 10 to 15 with Answers)**

1. In rapid prototyping “input” refers to [       ]  
a) Material                      b) CAD data                      c) Process                      d) Machine
2. Materials used in additive manufacturing techniques can be [       ]  
a) Wire                      b) Laminates                      c) Metal powder                      d) All of the above
3. A \_\_\_\_\_ is the first or original example of something that has been or will be copied or developed

**Answers**

- 1) b    2) d    3) prototype



**Unit-I: Liquid based Rapid – Prototyping systems**

**Important points / Definitions: (Minimum 15 to 20 points covering complete topics in that unit)**

1. Principle, process, advantages and limitations of Stereolithography
2. Process of Photopolymerization.
3. Principle, process, advantages and limitations of Solid Ground Curing
4. Principle, process, advantages and limitations of Laminated Object Modelling
5. Principle, process, advantages and limitations of Fused Deposition Modelling.

**Short Questions (minimum 10 previous JNTUH Questions – Year to be mentioned)**

1. What is photopolymerisation.
2. What is the principle behind stereolithography.
3. What are the different types of electromagnetic radiation used to solidify photopolymers.
4. What are photo initiators.
5. Why FDM is a slow process

**Long Questions (minimum 10 previous JNTUH Questions – Year to be mentioned)**

1. Explain the process of Stereolithography with a neat sketch.
2. Explain the process of photopolymerization and list out advantages and drawbacks of stereolithography.
3. Explain the process of Solid Ground Curing with a neat sketch.
4. List out advantages, drawbacks and applications of solid ground curing.
5. Explain the process of Laminated Object Manufacturing with a neat sketch.
6. Outline applications of LOM along with advantages and drawbacks.
7. Explain the process of Fused Deposition Modelling with a neat sketch.
8. Outline applications of FDM along with advantages and drawbacks.

**Fill in the Blanks / Choose the Best: (Minimum 10 to 15 with Answers)**

1. In Stereolithography the material used is [       ]  
a) PLA wire       b) liquid resin       c) solid sheets       d) powder
2. In Fused Deposition Modeling the material used is [       ]  
a) PLA wire       b) liquid resin       c) solid sheets       d) powder
3. The 3D model is converted to STL file format in which stage? [       ]  
a) Data export       b) Data validation and repair       c) Part orientation       d) post process
4. In Solid Ground Curing the liquid resin will be solidified by [       ]  
a) Laser       b) UV lamp       c) Air       d) None of



- the above
5. The process of linking small molecules into chain like large molecules is called [ ]  
a) Chaining                      b) Polymerization                      c) Solidification                      d) None of the above
6. In Laminated Object Manufacturing the sheets are cut by [ ]  
a) Laser                      b) Knife                      c) either (a) or (b)                      d) neither (a) or (b)
7. Stereolithography is a \_\_\_\_\_ process [ ]  
a) Point by point                      b) layer by layer                      c) Holographic surface  
d) None of the above
8. In \_\_\_\_\_ RP process the whole cross sectional area is cured at once.
9. The mask generation is carried out in \_\_\_\_\_ RP process.
10. If the selected laser wavelength is outside the wavelength which causes photopolymerisation in 'SLA', then the required wavelength range can be achieved by \_\_\_\_\_.
11. In Stereolithography the power of laser used will in the order of \_\_\_\_\_.
12. Paper as a material can be used in \_\_\_\_\_ process.

**Answers**

- 1) b    2) a    3) a    4) b    5) b    6) c    7) a    8) SGC    9) SGC  
10) Frequency duplication (frequency modulation)    11) 10-300 mW    12) LOM



**Unit-III: Powder based Rapid – Prototyping systems**

**Important points / Definitions: (Minimum 15 to 20 points covering complete topics in that unit)**

1. Principle, process, advantages and limitations of Selective laser sintering
2. Principle, process, advantages and limitations of 3D printing
3. Rapid Tooling – Definition.
4. Conventional tooling vs Rapid tooling.
5. Need for RT.
6. Rapid tooling classification.
7. Spray Metal Deposition,
8. RTV
9. Epoxy Tools, Ceramic tools,
10. Investment Casting,
11. Spin Casting, Die casting, Sand Casting,
12. 3D Keltool process.
13. Direct AIM,
14. LOM Tools,
15. DTM Rapid Tool Process,
16. EOS Direct Tool Process
17. Direct Metal Tooling using 3DP

**Short Questions (minimum 10 previous JNTUH Questions – Year to be mentioned)**

1. Which type of laser is used in selective laser sintering. What is the range of laser power used?
2. Why the laser used in selective laser sintering is different from stereolithography apparatus.
3. Why parts manufactured from 3D printing are weaker when compared to parts manufactured from Selective laser sintering.
4. Define hard tooling in terms of rapid tooling.
5. When comparing hard tooling and soft tooling explain which one will sustain greater number of manufacturing cycles.

**Long Questions (minimum 10 previous JNTUH Questions – Year to be mentioned)**

1. Using a sketch to illustrate your answer, describe the Selective Laser Sintering process.
2. Outline applications of SLS along with advantages and drawbacks.
3. Explain the process of Three Dimensional Printing with a neat sketch.
4. Outline applications of 3DP along with advantages and drawbacks.
5. Distinguish rapid tooling and conventional tooling.
6. Classify Rapid Tooling methods.



7. Explain the process of Spray Metal Deposition with a neat sketch.
8. Explain the process of RTV tooling a neat sketch.
9. Explain the process of 3D Keltool with a neat sketch.
10. Describe the process of AIM tooling.
11. What are LOM tools? Explain.
12. What is DTM Rapid tool process? Explain.
13. Explain the process of EOS Direct tool in brief.
14. Explain the process of Direct Metal Tooling using 3DP

**Fill in the Blanks / Choose the Best: (Minimum 10 to 15 with Answers)**

1. The 3DP process is a \_\_\_\_\_ process [     ]  
a) Point by point    b) layer by layer    c) Holographic surface  
d) None of the above
2. The type of laser used in selective laser sintering  
a) UV                      b) CO2                      c) Solid state laser                      d) He - Ne
3. The materials that can be used in SLS  
a) Polymers                      b) metal powders                      c) ceramics                      d) All the above
4. In 3DP the powder particles are joined by  
a) Laser                      b) binder                      c) ultrasonic waves                      d) none of the above
5. Which AMT process do not require support structures during manufacturing  
\_\_\_\_\_
6. The tooling in which the mould produced directly or indirectly is destroyed after a single cast or is used for a small batch production is \_\_\_\_\_ tooling.
7. The material used in RTV tools  
a) Epoxy                      b) metal                      c) silicone                      d) none of the above
8. In 3d Keltool green part refers to  
a) Metal mixture with polymer binder  
b) Rubber mould  
c) Metal cast  
d) Sand mould
9. In 3d Keltool infiltrating the sintered parts with copper is done to  
a) Increase the electrical conductivity  
b) Fill the pores with metal  
c) Increase weight  
d) To make it light weight

**Answers**

- 1) a 2) b 3) d 4) b 5) SLS 6) Soft tooling 7) c 8) a 9) b