GUJARAT TECHNOLOGICAL UNIVERSITY

BE-7 SEMESTER – OLD PAPER – S22 TO S26 – QUESTION BANK

Subject Name & Code: Rapid Prototyping - 3171926

Chapter 1: Introduction

Repeated Questions:

1. Prototyping and Rapid Prototyping:

- **Q.** Differentiate between Conventional/Traditional Prototyping and Rapid Prototyping. **(WINTER 2023, 4 Marks; SUMMER 2025, 3 Marks; WINTER 2025, 7 Marks; SUMMER 2026, 3 Marks)**
- **Q.** Define/What is Rapid Prototyping? Enlist its advantages. **(SUMMER 2022, 3 Marks; WINTER 2024, 3 Marks; WINTER 2025, 3 Marks)**

2. Additive and Subtractive Manufacturing:

- **Q.** Compare/Differentiate Additive and Subtractive Manufacturing processes. **(SUMMER 2022, 4 Marks; WINTER 2022, 3 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks)**

3. RP Classification and Process Steps:

- **Q.** Give the classification of Rapid Manufacturing/Rapid Prototyping processes. **(WINTER 2023, 7 Marks; SUMMER 2024, 4 Marks; SUMMER 2025, 4 Marks; WINTER 2025, 7 Marks OR)**
- **Q.** Explain the steps/generic process of a typical Rapid Prototyping/Additive Manufacturing process. **(SUMMER 2022, 7 Marks; WINTER 2024, 7 Marks)**

Other Important Questions:

1. Prototyping Basics, Need and Evolution:

- **Q.** What is Prototyping? **(WINTER 2024 – part a of a question)**
- **Q.** Briefly explain the need for Rapid Prototyping. **(SUMMER 2023, 3 Marks)**
- **Q.** Discuss the evolution of RP systems indicating the history and their growth rate. **(SUMMER 2023, 4 Marks)**
- **Q.** What are the main roles of the prototypes? How rapid prototyping satisfies these roles? **(SUMMER 2026, 4 Marks)**
- **Q.** Write the limitation of manual prototyping. **(WINTER 2025, 4 Marks)**
- **Q.** Discuss the importance of rapid prototyping technique in various industries. **(WINTER 2025, 7 Marks)**

2. RP versus Related Technologies:

- **Q.** Distinction between RP and CNC, other related technologies. **(Implied from syllabus – not directly asked as a full question)**
- **Q.** Write the limitation of NC/CNC. **(WINTER 2025, 4 Marks)**
- **Q.** Differentiate additive and subtractive manufacturing? Explain the generic additive manufacturing process with neat sketch. **(SUMMER 2026, 7 Marks)**

Chapter 2: CAD Data, Data Interfacing and Slicing

Repeated Questions:

1. CAD Data Formats:

- **Q.** Describe/Elaborate on the STL file format. Explain its importance in RP. **(SUMMER 2022, 3 Marks; WINTER 2022, 4 Marks; WINTER 2024, 3 Marks; SUMMER 2025, 7 Marks)**
- **Q.** Write the full form of various CAD data formats (STL, IGES, STEP, LEAF, etc.). **(SUMMER 2023, 4 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks)**
- **Q.** List the various types of solid models and explain CSG/B-Rep models. **(WINTER 2022, 7 Marks; SUMMER 2023, 3 Marks)**

2. Part Orientation, Support Structures and Tool Path:

- **Q.** Why is part orientation important in Rapid Prototyping/3D printing? Explain with examples. **(SUMMER 2022, 4 Marks; SUMMER 2023, 7 Marks; WINTER 2024, 4 Marks; SUMMER 2025, 3 Marks; WINTER 2025, 4 Marks)**
- **Q.** Explain support structure generation and tool path generation. **(SUMMER 2023, 7 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 7 Marks OR)**

3. Slicing and Data Validation:

- **Q.** Differentiate between Direct/Uniform Slicing and Adaptive Slicing. **(SUMMER 2022, 4 Marks; WINTER 2023, 4 Marks; SUMMER 2024, 4 Marks; SUMMER 2025, 4 Marks; WINTER 2025, 3 Marks OR; SUMMER 2026, 7 Marks OR)**
- **Q.** Explain slicing of a tessellated CAD model / contour and tool path generation with a flowchart. **(WINTER 2022, 7 Marks; WINTER 2024, 7 Marks)**
- **Q.** Explain the validity checks and repair procedures for CAD data/file conversion for RP. **(WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks OR; SUMMER 2025, 7 Marks OR)**

Other Important Questions:

1. Data Interfacing Formats:

- **Q.** What is Data interfacing formats? **(SUMMER 2023, 4 Marks)**
- **Q.** Enlist the name of data interfacing formats. **(WINTER 2025, 3 Marks OR)**
- **Q.** Write the importance of graphic standard. **(WINTER 2025, 3 Marks)**
- **Q.** Explain the strengths and weaknesses of CLI & HP/GL file formats. **(SUMMER 2022, 7 Marks)**
- **Q.** Differentiate RPI and STL file format. **(SUMMER 2022, 7 Marks OR)**
- **Q.** Write a short note on .slc file format. **(SUMMER 2025, 7 Marks)**
- **Q.** List various formats used by RP systems for data interfacing. Describe the STL format with an example. **(SUMMER 2026, 4 Marks)**
- **Q.** What causes missing facets or gaps to occur in STL file? **(SUMMER 2026, 3 Marks)**

2. CAD Modelling:

- **Q.** What is tessellation in CAD modelling? **(WINTER 2023, 3 Marks OR)**
- **Q.** Enlist the name of CAD modelling software. **(WINTER 2025, 3 Marks)**

3. Part Orientation and Support Structures:

- **Q.** Discuss the use of support structure. How part orientation affects requirement for support structure? **(SUMMER 2026, 7 Marks)**

4. Slicing Terms and Process Parameters:

- **Q.** Define: Chord Height, Staircase effect, Infill. **(SUMMER 2022, 3 Marks)**
- **Q.** Define the following terms • Layer thickness • Staircase effect • Infill density **(SUMMER 2026, 3 Marks)**

- **Q.** Define the following terms • Chord Height • Angle Control • Step Size **(SUMMER 2026, 3 Marks OR)**
- **Q.** Discuss the layer thickness and hatch space on microstructure and part quality. **(WINTER 2025, 7 Marks)**
- **Q.** Write the effect of layer thickness in build time. **(WINTER 2025, 4 Marks OR)**
- **Q.** Discuss the layer thickness and hatch space on mechanical properties with suitable graph. **(WINTER 2025, 7 Marks OR)**

Chapter 3: RP Processes

Repeated Questions:

1. Stereolithography (SLA) / Photopolymerization:

- **Q.** Explain the principle of working/physics of the Stereolithography (SLA) process with a neat sketch. **(SUMMER 2023, 7 Marks; SUMMER 2024, 4 Marks; SUMMER 2025, 4 Marks; WINTER 2025, 7 Marks OR; SUMMER 2026, 7 Marks)**
- **Q.** What is photopolymerization? Explain the process. **(SUMMER 2022, 4 Marks OR; SUMMER 2023, 3 Marks; WINTER 2023, 4 Marks)**
- **Q.** List the materials used for the Stereolithography/photopolymerization process. **(SUMMER 2024, 3 Marks; SUMMER 2025, 3 Marks)**
- **Q.** Write advantages, limitations, and applications of Stereolithography. **(WINTER 2023, 7 Marks OR; SUMMER 2025, 7 Marks)**
- **Q.** What is micro-stereolithography? **(SUMMER 2024, 3 Marks; SUMMER 2025, 7 Marks)**

2. Powder Bed Fusion (SLS, EBM, 3D Printing) and FDM:

- **Q.** Explain the Selective Laser Sintering (SLS) process with a neat sketch. Write its applications. **(WINTER 2022, 3 Marks – List; WINTER 2023, 7 Marks OR; WINTER 2024, 4 Marks – List; SUMMER 2025, 7 Marks OR; SUMMER 2026, 7 Marks OR)**
- **Q.** Write advantages, limitations, and applications of Fused Deposition Modelling (FDM). **(SUMMER 2022, 7 Marks; SUMMER 2024, 7 Marks; WINTER 2024, 7 Marks)**
- **Q.** Explain the Fused Deposition Modelling (FDM) process with a neat sketch. **(SUMMER 2022, 7 Marks; SUMMER 2023, 7 Marks OR; WINTER 2023, 7 Marks OR; WINTER 2024, 7 Marks; WINTER 2025, 7 Marks; SUMMER 2026, 7 Marks OR)**
- **Q.** Write applications of the 3D Printing process. **(WINTER 2023, 3 Marks OR; SUMMER 2024, 3 Marks)**
- **Q.** Explain the 3D printing process with a neat sketch. **(SUMMER 2025, 4 Marks OR; SUMMER 2026, 7 Marks)**
- **Q.** Write down the principle of Electron Beam Melting (EBM) Process. **(SUMMER 2022, 3 Marks; WINTER 2024, 3 Marks)**

3. Sheet Lamination (LOM, Ultrasonic Consolidation):

- **Q.** Define/Explain the principle of Laminated Object Manufacturing (LOM) process. **(WINTER 2023, 3 Marks OR; SUMMER 2024, 3 Marks OR)**
- **Q.** Explain Laminated Object Manufacturing (LOM) process with a neat sketch. **(WINTER 2022, 7 Marks; WINTER 2025, 7 Marks)**
- **Q.** Write advantages, limitations, and applications of Laminated Object Manufacturing (LOM). **(SUMMER 2022, 3 Marks; WINTER 2023, 4 Marks OR; SUMMER 2025, 4 Marks OR; SUMMER 2026, 4 Marks OR)**
- **Q.** Explain the Ultrasonic Consolidation process with a neat sketch and its applications. **(SUMMER 2024, 7 Marks OR; SUMMER 2025, 7 Marks OR)**

4. Beam Deposition (LENS, DMD):

- **Q.** What is Laser Engineered Net Shaping (LENS)? Explain with a neat sketch. **(SUMMER 2024, 7 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 3 Marks; SUMMER 2026, 7 Marks)**
- **Q.** Explain the Direct Metal Deposition (DMD) process with a neat sketch and its applications. **(SUMMER 2022, 3 Marks – List; SUMMER 2025, 7 Marks OR; SUMMER 2026, 4 Marks)**

5. Other Processes (SGC):

- **Q.** Discuss the advantages and disadvantages of SGC. **(WINTER 2022, 3 Marks OR; WINTER 2024, 4 Marks)**

Other Important Questions:

1. Stereolithography (SLA) / Photopolymerization:

- **Q.** Compose the principles behind stereo litho sintering process. Briefly explain the materials. **(SUMMER 2023, 7 Marks – likely a typo for "Stereolithography" in the source)**

2. Powder Bed Fusion (SLS, EBM, 3D Printing) and FDM:

- **Q.** List the important process parameters of FDM and explain any two. **(WINTER 2022, 4 Marks)**
- **Q.** Compare SLS, 3D Printing, and LOM processes. **(SUMMER 2024, 7 Marks OR)**
- **Q.** Distinguish the following process: FDM, LOM, SGC, and SLS. **(SUMMER 2023, 4 Marks)**
- **Q.** Differentiate SLA and SLS. **(SUMMER 2023, 3 Marks OR)**
- **Q.** Write the limitation of powder bed fusion process. **(WINTER 2025, 3 Marks)**
- **Q.** Explain Electron Beam Melting (EBM) process with neat sketch. **(SUMMER 2026, 7 Marks OR)**

3. Sheet Lamination (LOM, Ultrasonic Consolidation):

- **Q.** Discuss various materials used for LOM. **(SUMMER 2024, 4 Marks OR)**
- **Q.** Briefly explain the process physics of Ultrasonic Consolidation process. **(SUMMER 2024, 4 Marks)**

4. Beam Deposition (LENS, DMD):

- **Q.** Explain the principle of Beam deposition RP processes. **(WINTER 2023, 3 Marks OR)**
- **Q.** Discuss the advantages and disadvantages of LENS. **(WINTER 2022, 3 Marks)**
- **Q.** Write a short note on: Laser Engineered Net Shaping. **(SUMMER 2024, 7 Marks)**

5. Other Processes (SGC):

- **Q.** With neat sketches explain Solid Ground Curing (SGC) process and its advantages. **(SUMMER 2023, 4 Marks OR)**

Chapter 4: Errors in RP Processes

Repeated Questions:

1. Part Building Errors:

- **Q.** Explain various part building errors in RP / in SLA & SLS processes. **(SUMMER 2022, 4 Marks; SUMMER 2024, 7 Marks OR; SUMMER 2025, 7 Marks)**

2. Pre-processing and Post-processing Errors:

- **Q.** What are pre-processing errors? Explain different errors in the pre-processing part of RP processes. **(WINTER 2022, 4 Marks; SUMMER 2025, 3 Marks)**
- **Q.** Explain various errors that may occur during the post-processing phase in RP. **(WINTER 2022, 4 Marks OR; SUMMER 2024, 4 Marks OR; SUMMER 2025, 4 Marks OR; WINTER 2025, 4 Marks; SUMMER 2026, 3 Marks OR)**

Other Important Questions:

1. Data Preparation and Part Building Errors:

- **Q.** What is meant by data preparation error? **(SUMMER 2023, 3 Marks)**
- **Q.** Discuss the influence of various factors in determining the part building error and data preparation error. **(SUMMER 2023, 7 Marks)**
- **Q.** Explain the effect of part building, part finishing, and part deposition orientation on accuracy. **(SUMMER 2023, 7 Marks OR)**

2. Finishing and Processing Errors:

- **Q.** 'Usually RP parts need the finishing processes' Justify. **(WINTER 2023, 3 Marks)**
- **Q.** What are the different errors in processing part through rapid prototyping. **(SUMMER 2026, 3 Marks)**

Chapter 5: Rapid Tooling, Reverse Engineering and Applications

Repeated Questions:

1. Rapid Tooling:

- **Q.** What is Rapid Tooling? Explain with an example / one method. **(SUMMER 2022, 7 Marks; SUMMER 2023, 3 Marks; WINTER 2023, 3 Marks; SUMMER 2025, 3 Marks)**

2. Reverse Engineering:

- **Q.** Define Reverse Engineering. Explain its steps/process with an example. **(SUMMER 2022, 7 Marks; SUMMER 2023, 7 Marks; SUMMER 2024, 7 Marks; SUMMER 2025, 7 Marks; SUMMER 2026, 4 Marks)**

3. RP Applications by Industry:

- **Q.** Explain the applications of RP in the Medical field. **(SUMMER 2022, 7 Marks OR; WINTER 2022, 7 Marks; SUMMER 2025, 4 Marks; WINTER 2025, 4 Marks)**
- **Q.** Explain RP applications for automotive industries. **(SUMMER 2022, 4 Marks; WINTER 2024, 7 Marks)**
- **Q.** How is rapid prototyping transforming the jewelry industry? **(WINTER 2022, 7 Marks; WINTER 2024, 7 Marks)**
- **Q.** How does aerospace technology make use of rapid tooling? **(WINTER 2022, 3 Marks; WINTER 2024, 7 Marks)**
- **Q.** Enlist the different application of RP in the construction industry. **(WINTER 2022, 4 Marks; WINTER 2024, 4 Marks)**
- **Q.** Enlist & explain the RP applications in the field of manufacturing & tooling. **(SUMMER 2022, 4 Marks; WINTER 2024, 7 Marks)**

Other Important Questions:

1. Rapid Tooling Methods:

- **Q.** List out the various indirect rapid tooling methods and explain silicon rubber tooling. **(SUMMER 2023, 7 Marks)**
- **Q.** Differentiate between soft and hard tooling. **(SUMMER 2023, 3 Marks – on Page 2)**
- **Q.** Explain sand casting tooling and laminate tooling. **(SUMMER 2023, 7 Marks – on Page 2)**
- **Q.** Define & classify Rapid Tooling. **(SUMMER 2026, 4 Marks)**
- **Q.** Explain any one method of Direct Tooling. **(SUMMER 2026, 4 Marks OR)**
- **Q.** Give comparison of Powder Based Fusion RP and Extrusion based RP. **(WINTER 2023, 4 Marks OR)**

2. Reverse Engineering:

- **Q.** How RP is associated with reverse engineering? **(WINTER 2025, 3 Marks)**
- **Q.** How are data points acquired in reverse engineering? Enlist various methods. **(SUMMER 2026, 4 Marks OR)**

3. RP Applications:

- **Q.** Explain with an example the application of RP in the Bio-Medical industry. **(SUMMER 2023, 4 Marks – on Page 2)**
- **Q.** Write the aviation application of RP. **(WINTER 2025, 4 Marks OR)**
- **Q.** What are the typical RP applications in design? **(SUMMER 2026, 3 Marks)**
- **Q.** What are the typical RP applications in engineering and analysis? **(SUMMER 2026, 3 Marks OR)**

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