



M.E /M.TECH DEGREE EXAMINATIONS: APRIL /MAY 2024

(Regulation 2018)

Second Semester

MASTER OF TECHNOLOGY MANAGEMENT

P18TME0037: Rapid Prototyping Fundamentals

COURSE OUTCOMES

CO1: Define the importance of prototyping for an intrapreneur in Product Development.

CO2: Discover the appropriate approaches for rapid prototyping

CO3: Develop product concepts and prototypes to test the idea

Time: Three Hours

Maximum Marks: 100

**Answer all the Questions:-
PART A (10 x 1 = 10 Marks)**

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| 1. | What is the primary objective of rapid prototyping? | CO1 | [K ₁] |
| | a) Mass production | b) Cost reduction | |
| | c) Prototype validation | d) Market analysis | |
| 2. | What is the primary advantage of using Fused Deposition Modeling (FDM) in rapid prototyping? | CO2 | [K ₁] |
| | a) High accuracy | b) Low cost | |
| | c) Wide range of materials | d) Fast production speed | |
| 3. | Which rapid prototyping technique is suitable for producing metal parts directly from CAD data? | CO2 | [K ₁] |
| | a) Stereolithography | b) Selective Laser Sintering | |
| | c) Fused Deposition Modeling | d) Vacuum Casting | |
| 4. | Which of the following is NOT a common application of rapid prototyping? | CO2 | [K ₂] |
| | a) Medical modeling | b) Automotive manufacturing | |
| | c) Jewelry design | d) Agricultural equipment fabrication | |
| 5. | Which rapid prototyping technique involves the use of a powder bed and a high-power laser to selectively fuse powdered material? | CO2 | [K ₁] |

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|-----|---|---|-----|-------------------|
| | a) Fused Deposition Modeling | b) Selective Laser Sintering | | |
| | c) Stereolithography | d) Direct Metal Laser Sintering | | |
| 6. | What is the primary advantage of rapid prototyping over traditional manufacturing methods? | | CO1 | [K ₁] |
| | a) Higher material strength | b) Lower initial investment | | |
| | c) Faster production time | d) Greater scalability | | |
| 7. | What role does Computer-Aided Design (CAD) software play in rapid prototyping? | | CO3 | [K ₂] |
| | a) It converts physical prototypes into digital models | b) It generates toolpaths for CNC machining | | |
| | c) It designs virtual prototypes before physical production | d) It controls the operation of 3D printers | | |
| 8. | Which rapid prototyping technique is best suited for producing functional prototypes with high mechanical properties? | | CO2 | [K ₁] |
| | a) Fused Deposition Modeling | b) Stereolithography | | |
| | c) Selective Laser Sintering | d) PolyJet Printing | | |
| 9. | What is the main limitation of Stereolithography (SLA) in rapid prototyping? | | CO2 | [K ₂] |
| | a) Limited material choices | b) High cost | | |
| | c) Slow production speed | d) Poor surface finish | | |
| 10. | What is the significance of rapid prototyping in product development? | | CO3 | [K ₂] |
| | a) Reducing lead time | b) Minimizing material waste | | |
| | c) Enhancing final product quality | d) All of the above | | |

PART B (10 x 2 = 20 Marks)

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| 11. | Name two common applications of rapid prototyping. | CO1 | [K ₁] |
| 12. | Define STL file format in the context of rapid prototyping. | CO2 | [K ₂] |
| 13. | What is the primary benefit of using rapid prototyping in product development? | CO3 | [K ₁] |
| 14. | Explain the concept of layer-by-layer fabrication in rapid prototyping. | CO2 | [K ₂] |
| 15. | Describe the role of CAD software in rapid prototyping. | CO2 | [K ₂] |

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| 16. | How does Selective Laser Sintering (SLS) differ from Stereolithography (SLA) in rapid prototyping? | CO3 | [K ₂] |
| 17. | What is meant by the term "additive manufacturing" in the context of rapid prototyping? | CO3 | [K ₂] |
| 18. | Name two post-processing techniques commonly used in rapid prototyping. | CO2 | [K ₁] |
| 19. | Explain the importance of material selection in rapid prototyping. | CO1 | [K ₂] |
| 20. | Discuss one future trend or advancement in rapid prototyping technology | CO3 | [K ₂] |

PART C (6 x 5 = 30 Marks)

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| 21. | Describe the workflow of rapid prototyping, including the key stages involved. | CO2 | [K ₂] |
| 22. | Compare and contrast the additive manufacturing process with traditional subtractive manufacturing methods, highlighting their respective advantages and limitations. | CO3 | [K ₂] |
| 23. | Explain the concept of material selection in rapid prototyping, considering factors such as mechanical properties, cost, and suitability for the intended application. | CO2 | [K ₂] |
| 24. | Discuss the importance of design for manufacturability (DFM) principles in the context of rapid prototyping, providing examples of design considerations that optimize the prototyping process. | CO2 | [K ₂] |
| 25. | Discuss the role of quality assurance in rapid prototyping, outlining strategies for ensuring the accuracy, reliability, and consistency of prototyped parts. | CO3 | [K ₂] |
| 26. | What are the ethical considerations associated with rapid prototyping, particularly in areas such as intellectual property rights, product safety, and environmental sustainability. | CO3 | [K ₂] |

Answer any FOUR Questions PART D (4 x 10 = 40 Marks)

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| 27. Evaluate the impact of rapid prototyping on the medical field, focusing on its contributions to personalized medicine, surgical planning, and prosthetics development. | CO1 | [K ₅] |
| 28. Analyze the role of rapid prototyping in the aerospace industry, discussing its impact on design iteration cycles, cost reduction, and performance optimization. | CO2 | [K ₄] |
| 29. List down the challenges and opportunities associated with the integration of rapid prototyping with emerging technologies such as artificial intelligence (AI), blockchain, and advanced robotics. | CO3 | [K ₂] |
| 30. Analyze the role of rapid prototyping in sustainable design and manufacturing, discussing its potential to reduce environmental impact, promote circular economy principles, and minimize resource consumption. | CO2 | [K ₄] |
| 31. Analyze the impact of rapid prototyping on traditional manufacturing processes and supply chain management, discussing its implications for reshoring, localization, and just-in-time production. | CO3 | [K ₄] |
