



**B.E DEGREE EXAMINATIONS:NOV/DEC 2023**

(Regulation 2018)

Seventh Semester

**AERONAUTICAL ENGINEERING**

U18AEE0018: Additive Manufacturing and Tooling

**COURSE OUTCOMES**

**CO1:** Classify the concepts and terminologies of additive manufacturing.

**CO2:** Apply the reverse engineering concepts for design development.

**CO3:** Identify the variety of additive manufacturing techniques based on end product applications.

**CO4:** Design and develop newer tooling models.

**CO5:** Familiarise with cutting edge technologies in rapid tooling and manufacturing.

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 2 = 20 Marks)**

**(Answer not more than 40 words)**

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|---|-----|-------------------|
| 1. How would you define prototype in the context of modern product development?   | CO1 | [K <sub>2</sub> ] |
| 2. In what form of material can Rapid Prototyping Systems be classified as solid-based? Name three such systems.              | CO1 | [K <sub>2</sub> ] |
| 3. List any three Digitization techniques used in Reverse Engineering.  | CO2 | [K <sub>2</sub> ] |
| 4. Why three dimensional reconstructions are necessary in reverse engineering and list any two challenges associated with it. | CO2 | [K <sub>2</sub> ] |
| 5. What is photo polymerization? Why it is necessary in SL resin?   | CO3 | [K <sub>2</sub> ] |
| 6. Outline the primary application-based differences between stereolithography and fused deposition modeling                  | CO3 | [K <sub>2</sub> ] |
| 7. How do surface deviation and accuracy maintenance pose challenges in selective laser sintering (SLS)?                      | CO4 | [K <sub>2</sub> ] |
| 8. List any four typical applications of Laser Engineered Net Shaping (LENS).   | CO4 | [K <sub>2</sub> ] |
| 9. What are the three primary requirements for a master used in RTV soft tooling?   | CO5 | [K <sub>2</sub> ] |
| 10. What are the key distinctions between direct and indirect tooling methods?  | CO5 | [K <sub>2</sub> ] |

**Answer any FIVE Questions:-**

**PART B (5 x 16 = 80 Marks)**

**(Answer not more than 400 words)**

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|-----|---|----|-----|-------------------|
| 11. | Detail the process chain in Additive Manufacturing, emphasizing its capabilities in fabricating complex parts. Discuss the salient features of this technology. Highlight the challenges specifically related to metal additive manufacturing.      | 16 | CO1 | [K <sub>3</sub> ] |
| 12. | Elaborate the different types of non-contact reverse engineering techniques. List any four merits and demerits of each type.  | 16 | CO2 | [K <sub>2</sub> ] |
| 13. | a) Elaborate the fundamental principles, operational processes, strengths, weaknesses, and key applications associated with Solid Ground Curing (SGC)?  | 12 | CO3 | [K <sub>2</sub> ] |
|     | b) What are four diverse applications where Laminated Object Manufacturing (LOM) finds practical use?   | 4  | CO3 | [K <sub>2</sub> ] |
| 14. | Explain principles associated with Selective Laser Sintering (SLS) with a neat sketch. Compare and contrast the methodologies of indirect and direct SLS concerning powder structures, materials used, and the post-processing techniques involved. | 16 | CO4 | [K <sub>2</sub> ] |
| 15. | a) What are the primary challenges and solutions related to the recoating process in Stereo lithography Apparatus (SLA) technology?   | 8  | CO3 | [K <sub>3</sub> ] |
|     | b) What specific challenges are encountered in maintaining the accuracy of fabricated parts using the Fused Deposition Modeling (FDM) technique?  | 8  | CO3 | [K <sub>3</sub> ] |
| 16. | Describe three rapid tooling techniques, their typical applications, and associated challenges.   | 16 | CO5 | [K <sub>2</sub> ] |

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