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|--|---|----|-----|
| 13. List any four digitalization techniques used in 3D Printing with suitable diagram. | 2 | K1 | CO2 |
| 14. What is digitization in the context of additive manufacturing? | 2 | K1 | CO2 |
| 15. Explain the concept of Indirect and Direct SLS in additive manufacturing. | 2 | K2 | CO3 |
| 16. List the advantages of Fused Deposition Modeling (FDM) in additive Manufacturing, | 2 | K1 | CO3 |
| 17. Explain about the three dimensions of sustainability. | 2 | K2 | CO4 |
| 18. Give some examples of Sustainable Development. | 2 | K1 | CO4 |
| 19. Explain the four steps of life cycle assessment. | 2 | K2 | CO4 |
| 20. Explain the main stages of MSDS. | 2 | K2 | CO5 |
| 21. List the key elements of Sustainable Product-Service System (PSS) design. | 2 | K1 | CO5 |
| 22. Define strategic analysis. | 2 | K2 | CO5 |

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

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| 23. a) Describe the Additive Manufacturing (AM) process chain in detail. | 11 | K2 | CO1 |
| OR | | | |
| b) Summarize the use of 3D printer for disaster management. | 11 | K2 | CO1 |
| 24. a) What is Rapid Tooling? What are its types? Explain any one with suitable diagram. | 11 | K2 | CO2 |
| OR | | | |
| b) Elaborate on the role of support generation in additive manufacturing with its types. | 11 | K2 | CO2 |
| 25. a) Provide an in-depth overview of the Selective Laser Sintering (SLS) process, including its advantages, limitations, and notable applications. | 11 | K2 | CO3 |
| OR | | | |
| b) Explain the key components and process variables involved in Solid Ground Curing (SGC) and its applications in various industries. | 11 | K2 | CO3 |
| 26. a) Explain in detail about the following | 5 | K2 | CO4 |
| (i) Cradle to Cradle | | | |
| (ii) Circular economy | 6 | K2 | CO4 |
| OR | | | |
| b) (i) Explain in detail about various systems approaches to design. | 5 | K2 | CO4 |
| (ii) Explain how sustainable development goals help in developing 3D printing models for the society. | 6 | K2 | CO4 |
| 27. a) Define Sustainable Product-Service System (PSS) design, and explain how does it prioritize sustainability over traditional product-centric approaches. | 11 | K2 | CO5 |
| OR | | | |
| b) What is the design tools used in Sustainable Development Systems? Explain any five in detail. | 11 | K2 | CO5 |
| 28. a) Explore the working principles of Laser Engineered Net Shaping (LENS) and its applications. | 11 | K2 | CO3 |
| OR | | | |
| b) With suitable diagram explain how hybrid additive manufacturing works. | 11 | K2 | CO3 |