Reg. No. :

Question Paper Code: U9773

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2024

Open elective

Mechanical Engineering

21UME973 – INTRODUCTION TO ADDITIVE MANUFACTURING

(Common to All Engineering branches)

(Regulations 2021)

Duration: Three hours   Maximum: 100 Marks

Answer All Questions

PART A - (10 x 1 = 10 Marks)

1. What is the primary focus of Rapid Tooling in the AM process chain?   CO1 U

    (a) Creating large batches of products   (b) Producing functional prototypes

    (c) Fabricating molds or dies quickly   (d) Developing design concepts

2. In the healthcare industry, which advantage does Additive   CO1 U
    Manufacturing provide?

    (a) High-speed mass production   (b) Custom-made implants and prosthetics

    (c) Standardized pharmaceutical production   (d) Non-functional decorative products

3. What is the role of support structures in Additive Manufacturing?   CO1 U

    (a) To add material to parts that do not require it

    (b) To stabilize overhanging features during the build process

    (c) To increase the cost of the print

    (d) To reduce the strength of the part

4. What is the purpose of tool path generation in Additive Manufacturing?   CO1 U

    (a) Creating the design of the final product

    (b) Determining the path that the AM machine will follow during material deposition

    (c) Adding post-processing details

    (d) Preparing the materials for printing

5. Which application is common for SLA technology? CO1 U

(a) Printing flexible electronics (b) Creating dental models and jewelry molds

(c) Metal part manufacturing (d) Large-scale construction

6. What distinguishes CLIP from other photopolymerization processes? CO1 U

(a) It uses a continuous printing process without discrete layers

(b) It uses powdered metals for deposition

(c) It is slower than SLA and DLP

(d) It is limited to small object creation

7. What is a limitation of FDM compared to other AM technologies? CO1 U

(a) Limited build size (b) Lower resolution and surface finish

(c) High production costs (d) Limited material selection

8. What is one key advantage of SLM over other AM processes? CO1 U

(a) No post-processing is required

(b) Ability to produce fully dense metal parts

(c) It only works with polymers

(d) It requires no support structures

9. What is a limitation of the Laminated Object Manufacturing (LOM) process? CO1 U

(a) Limited ability to print complex geometries

(b) High cost of material

(c) High energy consumption

(d) Limited surface finish quality

10. What is the basic principle behind Laminated Object Manufacturing (LOM)? CO1 U

(a) Fusing powder layers with a laser

(b) Extruding melted material layer by layer

(c) Bonding layers of material sheets through adhesive or heat

(d) Using UV light to cure liquid resin

PART – B (5 x 2= 10Marks)

11. What are the future directions for AM technology? CO1 U
12. How does topology optimization benefit AM design CO1 U
13. What are some applications of LENS? CO1 U

14. What are some limitations of FDM compared to other AM technologies? CO1 U

15. What are some common applications of LOM? CO1 U

PART – C (5 x 16= 80Marks)

16. (a) Develop the concept of Bio Printing in Additive Manufacturing. CO2 App (16)
Discuss how AM is being used for tissue engineering, organ
fabrication, and its potential implications for the medical field.

Or

(b) Make use of Additive Manufacturing in Food Printing. Discuss its CO2 App (16)
applications, benefits, and the challenges it faces in becoming a
mainstream food production method.

17. (a) Plan the process of CAD model preparation for Additive CO2 App (16)
Manufacturing. Discuss the critical steps involved, including
design considerations, model validation, and optimization for the
AM process. How does CAD model preparation affect the overall
quality of the final product?

Or

(b) Choose and contrast the STL and AMF file formats used in CO2 App (16)
Additive Manufacturing. Discuss the limitations of the STL format
and how the AMF format overcomes these challenges. Provide
examples of common issues that arise due to the use of STL file

18. (a) Construct the process of Laser Engineered Net Shaping (LENS) in CO3 App (16)
Directed Energy Deposition. Discuss how material is delivered and
deposited layer by layer using laser energy. What are the critical
factors influencing the process, such as laser power, feed rate, and
material type?

Or

(b) Develop the various types of materials that can be used in Laser CO3 App (16)
Engineered Net Shaping (LENS). Discuss the properties of these
materials and their suitability for high-performance applications in
aerospace, defense, and tooling industries.

19. (a) Construct the working of Electron Beam Melting (EBM). How CO4 App (16)
does the process differ from Selective Laser Melting (SLM),
particularly in terms of energy source, powder fusion, and material
properties?

Or

(b) Construct the Fused Deposition Modeling (FDM) process in detail. CO4 App (16)
Discuss the step-by-step process of material extrusion, focusing on
how thermoplastic materials are deposited layer by layer to build
parts.

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20. (a) Choose the mechanisms of gluing or adhesive bonding and thermal CO5 App (16)
bonding in Laminated Object Manufacturing (LOM). How do
these mechanisms influence the strength, precision, and durability
of the final part? Provide examples where each bonding
mechanism is preferred

Or

(b) Identify the materials used in Laminated Object Manufacturing CO5 App (16)
(LOM), such as paper, plastics, and metals. How are these
materials applied in different industries? Provide examples of
LOM applications in packaging, prototyping, and tooling.

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