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Subject Code:- AME0612

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: VI - THEORY EXAMINATION (20.....- 20.....)

Subject: Rapid Prototyping and Manufacturing

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

20

1. Attempt all parts:-

- 1-a. What is the purpose of a slicer in 3D printing? (CO1, K1) 1
- (a) To convert a 3D model into machine code
 - (b) To control the temperature of the printer
 - (c) To provide support structures for the part
 - (d) To improve the surface finish of the part
- 1-b. Which of the following is a common file format used for 3D printing? (CO1, K1) 1
- (a) .png
 - (b) .jpeg
 - (c) .stl
 - (d) .doc
- 1-c. What is the main advantage of PolyJET 3D printing over Stereolithography? (CO2, K1) 1
- (a) PolyJET 3D printing is faster than SLA
 - (b) PolyJET 3D printing can print with more materials than SLA
 - (c) PolyJET 3D printing produces more accurate and smoother surfaces than SLA
 - (d) PolyJET 3D printing is more affordable than SLA
- 1-d. Which of the following is a post-processing step required after printing with SGC? (CO2, K1) 1
- (a) Sanding and polishing

- (b) Painting and coating
 - (c) Heating and annealing
 - (d) None, the object is ready to use
- 1-e. Which of the following factors affect the resolution of SGC printing? (CO3, K1) 1
- (a) UV light intensity
 - (b) Resin viscosity
 - (c) Layer thickness
 - (d) All of the above
- 1-f. What is the main disadvantage of Laminated Object Manufacturing (LOM) compared to other 3D printing processes? (CO3, K1) 1
- (a) Poor mechanical strength of the printed parts
 - (b) Limited range of available materials
 - (c) Limited resolution and accuracy
 - (d) High cost of equipment and maintenance
- 1-g. What is the maximum temperature reached in the SLS process? (CO4, K1) 1
- (a) Around 200°C
 - (b) Around 500°C
 - (c) Around 1000°C
 - (d) None of the above
- 1-h. What is the typical sintering temperature for Binder Jetting? (CO4, K1) 1
- (a) 500-600°C
 - (b) 700-800°C
 - (c) 900-1000°C
 - (d) None of the above
- 1-i. Which of the following is an application of 3D printing in the field of robotics? (CO5, K1) 1
- (a) Prototyping and testing robot parts
 - (b) Producing custom robot end-effectors and grippers
 - (c) Creating robot models for educational purposes
 - (d) All of the above
- 1-j. Which of the following technologies is commonly used in rapid tooling? (CO5, K1) 1
- (a) Injection molding
 - (b) CNC machining
 - (c) Vacuum casting
 - (d) All of the above

2. Attempt all parts:-

- 2.a. What are the advantages of 3D printing over traditional manufacturing methods? 2

(CO1, K1)

- 2.b. What types of materials can be used with SGC? (CO2, K1) 2
- 2.c. What are the benefits of Ultrasonic Consolidation? (CO3, K1) 2
- 2.d. What are the limitations of Binder Jetting? (CO4, K1) 2
- 2.e. What are the limitations of vacuum casting in manufacturing? (CO5, K1) 2

SECTION-B

30

3. Answer any five of the following:-

- 3-a. What are the main technological breakthroughs that have enabled the development of rapid prototyping? Explain in brief. (CO1, K2) 6
- 3-b. What is 3D modeling and 3D scanning? Why is it important in rapid prototyping? (CO1, K2) 6
- 3-c. What is Solid Ground Curing (SGC)? What are the different models and specifications available in SGC technology? (CO2, K2) 6
- 3-d. What are the advantages and disadvantages of using PolyJet technology for 3D printing? (CO2, K2) 6
- 3.e. What are the advantages and disadvantages of using Laminated Object Manufacturing in the manufacturing process? (CO3, K2) 6
- 3.f. What are the steps involved in preparing a part for SLS printing? Explain with suitable examples. (CO4, K2) 6
- 3.g. Discuss various biomedical applications of 3D printing? (CO5, K2) 6

SECTION-C

50

4. Answer any one of the following:-

- 4-a. What are the different types of 3D printing technologies available today, and how do they differ each other's? (CO1, K2) 10
- 4-b. What were the main challenges faced in the development of rapid prototyping technology? Explain in brief. (CO1, K2) 10

5. Answer any one of the following:-

- 5-a. What is the impact of environmental factors, such as temperature and humidity, on the liquid-based rapid prototyping process, and how can these factors be controlled? (CO2, K2) 10
- 5-b. Critically evaluate a case study in which liquid-based rapid prototyping was not successful. What were the reasons for the failure, and what could have been done differently to improve the outcome? (CO2, K3) 10

6. Answer any one of the following:-

- 6-a. Explain the different applications of solid-based rapid prototyping techniques in various industries, including automotive, aerospace, and medical. (CO3, K2) 10
- 6-b. Discuss the role of Fused Deposition Modeling (FDM) in the development of a medical device. Provide a case study and explain how FDM was used to create prototypes for testing and validation. (CO3, K2) 10

7. Answer any one of the following:-

- 7-a. Discuss the importance of material selection in powder-based rapid prototyping, including the properties of materials that make them suitable for this technique. (CO4, K2) 10
- 7-b. Compare and contrast the SLS, binder jetting, and Inkjet fusion processes in terms of their materials, equipment, and applications. (CO4, K2) 10

8. Answer any one of the following:-

- 8-a. What is post processing and why is it important in rapid prototyping? What are the key steps involved in post processing? Explain in brief. (CO5, K2) 10
- 8-b. What are the applications and limitations of rapid prototyping in the manufacturing industry? Explain in brief. (CO5, K2) 10

REG:JAN_JUN-2025