Printed Page:- 04 **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 (2022-2023)

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 laser in 3D printing? (CO1) 1

(a) To control the temperature of the printer

(b) To improve the strength of the part

(c) To selectively melt or sinter material

(d) To provide additional support for the part

1-b. What is the purpose of a recoater in 3D printing? (CO1) 1

(a) To control the temperature of the printer

(b) To improve the strength of the part

(c) To improve the surface finish of the part

(d) To add additional features to the part

1-c. What does the abbreviation SGC stand for? (CO2) 1

(a) Solidified Ground Curing

(b) Solid Ground Curing

(c) Submerged Ground Curing

(d) Semi-Global Curing

1-d. In Laminated Object Manufacturing (LOM), what is the main purpose of the laser or other cutting tool used to cut the layers of material? (CO2) 1

(a) To melt the material and fuse it together

(b) To remove excess material and create the desired shape

(c) To add texture and surface details to the object

(d) To create holes and channels for internal structures

1-e. Which of the following industries commonly uses SGC for rapid prototyping? (CO3) 1

(a) Automotive

(b) Education

(c) Food and Beverage

(d) Healthcare

1-f. How does PolyJET 3D printing technology achieve high accuracy and resolution? (CO3) 1

(a) By using a high-powered laser to fuse the materials together

(b) By using a high-precision print head to jet tiny droplets of material

(c) By using a heated print bed to ensure better adhesion of the layers

(d) By using a specialized software to optimize the printing process

1-g. What is the difference between SLS and selective laser melting (SLM)? (CO4) 1

(a) SLS uses a lower laser power than SLM

(b) SLS and SLM use the same process but different materials

(c) SLS uses a laser to sinter material while SLM uses a laser to melt it completely

(d) None of the above

1-h. What is the main disadvantage of using SLS 3D printing for mass production of parts? (CO4) 1

(a) High cost per part

(b) Long print times

(c) Limited material options

(d) None of the above

1-i. How has 3D printing impacted the field of music? (CO5) 1

(a) It has enabled the creation of custom musical instruments

(b) It has reduced the cost of instrument production

(c) It has increased the accessibility of musical instruments

(d) All of the above

1-j. What is the potential application of 3D printing in the field of disaster relief? (CO5) 1

(a) Producing replacement parts for damaged infrastructure

(b) Creating emergency shelters and housing

(c) Fabricating medical supplies and equipment

(d) All of the above

2. Attempt all parts:-

2.a. What are some common pre-processing techniques used in 3D printing? (CO1) 2

2.b. Write names of various Liquid based RP techniques. (CO2) 2

2.c. Can Ultrasonic Consolidation be used to print flexible parts? (CO3) 2

2.d. How does Binder Jetting work? (CO4) 2

2.e. Can composite 3D printing be used for large-scale production? (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. How does rapid prototyping help in reducing waste and improving sustainability? (CO1) 6

3-b. What are the different applications of rapid prototyping in the art and entertainment industry? (CO1) 6

3-c. What are the different types of light sources used in SLA?How do these light sources affect the final output of an SLA printed object? (CO2) 6

3-d. What is Solid Ground Curing (SGC)? What are the different models and specifications available in SGC technology? (CO2) 6

3.e. What is the working principle of Laminated Object Manufacturing? How does the process of Laminated Object Manufacturing work? (CO3) 6

3.f. Can you explain the Binder Jetting process in detail, including the steps involved and how the binder is applied to the powder material? (CO4) 6

3.g. What are the applications, advantages and disadvantages of composite 3D printing? (CO5) 6

SECTION C **50**

4. Answer any <u>one</u> of the following:-

4-a.	What are the different types of 3D printing technologies available today, and how do they differ? (CO1)	10
4-b.	What are some of the social implications of 3D printing, such as job displacement and economic impacts? (CO1)	10

5. Answer any <u>one</u> of the following:-

5-a.	What are the safety considerations when working with SLA, SGC, and PolyJet technologies? (CO2)	10
5-b.	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)	10

6. Answer any <u>one</u> of the following:-

6-a.	Describe the steps involved in the solid-based rapid prototyping process, including the software used, equipment required, and any potential limitations. (CO3)	10
6-b.	Explain the different applications of solid-based rapid prototyping techniques in various industries, including automotive, aerospace, and medical. (CO3)	10

7. Answer any <u>one</u> of the following:-

7-a.	What are some advantages and limitations of powder-based rapid prototyping techniques, and how do these compare to other rapid prototyping methods? (CO4)	10
7-b.	How does binder jetting differ from SLS and Inkjet fusion processes in terms of material usage, post-processing, and part strength? (CO4)	10

8. Answer any <u>one</u> of the following:-

8-a.	Elaborate different types of data conversion techniques used in rapid prototyping? How does data conversion and transmission impact the time to market for new products? (CO5)	10
8-b.	What is post processing and why is it important in rapid prototyping? What are the key steps involved in post processing? (CO5)	10