Which of the following most accurately describes 3D bioprinting?

A. Manufacturing biological tissues and organs out of living cells only using a 3D bioprinter

B. Manufacturing biological tissues and organs out of living cells and non-living biomaterials using a 3D bioprinter

C. Manufacturing non-living tissues and organs using a 3D printer that are intended for use in medicine

D. Using living organisms to "print" biological tissues and organs that will be used in medicine

What is a potential benefit that could one day be achieved with 3D bioprinting?

A. To help patients who are in need of new tissues or organs

B. To aid in the testing of new drugs

C. To reduce the risk of transplant rejection using host cells

D. All of the above

What is a current capability of 3D bioprinting?

A. Printing tissue samples for use in drug testing

B. Printing small organs like ears or bones

C. Printing complex, functional organs like hearts and kidneys

D. All of the above

Which of the following is not a limitation of 3D bioprinting?

A. The abundant and branched nature of the vasculature is difficult to reproduce

B. Risk of immune rejection is high when using foreign materials

C. Accurately printing tissues on the micro-scale

D. Finding long-lasting, biocompatible materials that will not have negative side-effects

Which of the following are considered types of extracellular matrix (ECM) biomaterials?

A. Collagen

B. Cardiac cells

C. Elastin

D. A and C

Which of the following process is suitable for making injection molding tools?

A. SL

B. SLS

C. EBM

D. FDM

Which one of the following is not Extrusion-Based RP Systems?

A. Fused Deposition Modelling (FDM)

B. 3D Printing

C. Sheet Lamination (Laminated Object Manufacturing (LOM))

D. Electron Beam melting (EBM)

Which of the following is the firststep of the rapid prototyping process?

A. 3D Modeling

B. Data Conversion

C. Building

D. Postprocessing

Which of the following is the last step of the rapid prototyping process?

A. 3D Modeling

B. Data Conversion

C. Building

D. Postprocessing

In STL files Euler's rule for solids can be written as

A. No. of faces – No. of edges + No. of vertices = 3 x No. of bodies

B. No. of faces – No. of edges + No. of vertices = No. of bodies

C. No. of faces – No. of edges + No. of vertices = 2 x No. of bodies

D. No. of faces – No. of edges + No. of vertices = 4 x No. of bodies

Which of the following is not Liquid-based RP system?

(A) Stereolithography Apparatus (SLA)

(B) Laminated Object Manufacturing (LOM)

(C) Solid Ground Curing (SGC)

(D) Solid Object Ultraviolet-Laser Printer (SOUP)

Solid Ground Curing (SGC) is developed by_____.

(A) 3D Systems

(B) Sony

(C) CMET

(D) Cubital

Full form of FDM is _____.

(A) Fixed Development Modelling

(B) Fusion Development Modelling

(C) Fused Deposition Modelling

(D) Focused Deposition Modelling

Full form of MJM is_____.

(A) Multi Joint Modelling

(B) Multi Jet Modelling

(C) Muted Jet Modelling

(D) Mitred Jet Modelling

Which of the following is not Solid-based RP system?

(A) Laminated Object Manufacturing (LOM)

(B) Paper Lamination Technology (PLT)

(C) Electron Beam Melting (EBM)

(D) Fused Deposition Modeling (FDM)

Laminated Object Manufacturing (LOM) is developed by_____.

(A) Stratasys

(B) CAM-LEM

(C) Kira Corporation

(D) Cubic Technologies

Full form of LENS is _____.

(A) Lamination Electron Net Sintering

(B) Laminated Engineered Net Shaping

(C) Laser Engineered Net Shaping

D) Laser Engineered Net Sintering

8. Which of the following is not Powder-Based RP system?

(A) Selective Laser Sintering (SLS)

(B) Solid Object Ultraviolet-Laser Printer (SOUP)

(C) Electron Beam Melting (EBM)

(D) Direct Metal Deposition (DMD)

9. Electron Beam Melting (EBM) is developed by_____.

(A) Acram

(B) 3D Systems

(C) Z Corporation

(D) Optomec

10.Which of the following RP system is not developed by 3D systems?

(A) Selective Laser Sintering (SLS)

(B) Multi-Jet Modeling System (MJM)

(C) Paper Lamination Technology (PLT)

(D) Stereolithography Apparatus (SLA)

11.Which of the following is used as base material in Stereolithography (SLA) process?

(A) Thermoplastics , Metals powders

(B) Thermoplastics , Eutectic metals.

(C) Photopolymer

(D) Titanium alloys

12.Which of the following is used as base material in Electron Beam Melting (EBM) process?

(A) Titanium alloys

(B) Photopolymer

(C) Various materials

(D) Paper

13.Which of the following is used as base material in Selective laser sintering (SLS)?

(A) Photopolymer

(B) Thermoplastics, Metal powders

(C) Titanium alloys

(D) Various materials

14.Which of the following advantage does not possess by the rapid prototyping process over the traditional prototyping process?

(A) It consumes less time

(B) Gives better quality

(C) Reduces product launch time

(D) It's cheaper

Full form of SOUP is_____.

(A) Solid Object Unidirectional Printer

(B) Solid Object Ultraviolet Printer

(C) Solid Object Ultraviolet-Laser Printer

(D) Solid Object Unidirectional Laser Printer

16.In STL files Euler's rule for solids can be written as

(A) No. of faces – No. of edges + No. of vertices = 3 x No. of bodies

(B) No. of faces – No. of edges + No. of vertices = No. of bodies

(C) No. of faces – No. of edges + No. of vertices = 2 x No. of bodies

(D) No. of faces – No. of edges + No. of vertices = 4 x No. of bodies

17.All triangle coordinates within an STL file must be_____.

(A) negative

(B) positive

(C) zero

(D) symmetric

18.Which of the following is the process in the RP cycle?

(A) Post-processing

(B) Transfer to machine

(C) Pre-processing

(D) All of the above

19.What is the other name of Multi Jet Modeling?

(A) FDM

(B) Poly Jet

(C) 3D Printer

(D) Extrusion

20.Which of the following is one of the design process steps?

(A) Build

(B) Concept

(C) Pre-processing

(D) Transfer to machine

21.Which CAD software can not be used to create data for the prototyping machine?

(A) CREO

(B) CATIA

(C) NX Unigraphics

(D) Adobe Illustrator

22.Which one of the process is subtractive prototyping?

(A) 5 axis CNC Milling

(B) Fused Deposition Modeling

(C) Multi-Jet Modeling

(D) Stereolithography Apparatus

23.Which of the following is the process of the pre-processing stage?

(A) Remove support

(B) Checking 3D CAD data

(C) De-powdering loose material

(D) Dip in a binder to strengthen the part

24.A computer model of a part design on a CAD system is called which of the following?

(A) Computer Prototype

(B) Geometric Prototype

(C) Solid Prototype

(D) Virtual Prototype

25.Which one of the following rapid prototyping processes uses a photosensitive liquid polymer as the starting material?

(A) Droplet Deposition Manufacturing

(B) Used-Deposition Modeling

(C) Laminated-Object Manufacturing

(D) Stereolithography

26.Which of the following RP technologies uses powders as the starting material?

(A) Droplet Deposition Manufacturing

(B) Fused-Deposition Modeling

(C) Selective Laser Sintering

(D) Stereolithography

27.Which of the following RP technologies uses molten material as the starting material?

(A) Three-Dimensional Printing

(B) Fused-Deposition Modeling

(C) Stereolithography

(D) Selective Laser Sintering

28.Ballistic-particle manufacturing is another name for which one of the following RP technologies? (A) Droplet Deposition Manufacturing

(B) Fused-Deposition Modeling

(C) Laminated-Object Manufacturing

(D) Selective Laser Sintering

29.Which of the following are examples of appropriate applications of additive manufacturing in the actual production of parts and products?

(A) Castings made in small quantities

(B) Plastic parts in small batch sizes

(C) Mass-produced metal parts

(D) Special textile products

30.Which of the following are problems with the current rapid prototyping and additive manufacturing technologies?

(A) Limited material variety

(B) Inability to convert a solid part into layers

(C) Poor machinability of the starting material

(D) The inability of the designer to design the part

31.From following, the alternative name for RP is _____.

(A) Additive Manufacturing

(B) Layer Manufacturing

(C)Direct CAD Manufacturing

(D)All of the above

32.Input of RP data is _____.

(A) CAM data

(B) CAPP data

(C)CAD data

(D)All of the above

33.In the _____ process, one starts with a single block of solid material larger than the final size of the desired object and material is removed until the desired shape is reached.

(A)Subtractive process

(B) Additive process

(C)Formative process

(D)All of above

34._____ is one where mechanical forces or restricting forms are applied on a material so as to form it into the desired shape.

(A) Subtractive process

(B) Additive process

(C)Formative process

(D)All of above

35.Which of the following is not subtractive process?

(A) Milling

(B)Stereo-lithography

(C)Sawing

(D)EDM

36.Which of the following process is not formative process?

(A) Bending

(B) Plastic injection molding

(C)Selective Laser Sintering

(D)Forging

37.Choose the correct sequence to generate prototype.

(A)3D CAD data - CAD solid model - STL file - RP prototype

(B) CAD solid model - 3D CAD data - RP prototype - STL file

(C)STL file - 3D CAD data - CAD solid model - RP prototype

(D)3D CAD data - STL file - CAD solid model - RP prototype

38.Which of the following can not be the input of CAD solid model?

(A) Physical mockup

(B) 2D surface data

(C)Tooling

(D)3D CAD data

39.Full form of STL is _____.

(A) Straight-lithography

(B) Streto-lithography

(C)Stereo-lithography

(D)Straight-lipsography

40.For rapid prototyping 3D CAD model should be converted into_____file.

(A) SGC

(B) SLA

(C)STL

(D)SLS

41.Process of converting STL file model in to layers is called_____in RP.

(A) chopping

(B)slicing

(C)cutting

(D)trimming

42.Support structures are required for _____.

(A)overhanging portions

(B) thin portions

(C)thick portions

(D)all of the above

43.The STL files translate the part geometry from a CAD system to_____.

(A) CNC machine

(B) CMM machine

(C)RP machine

(D)CAPP machine

44.Slicing a part is easier in _____.

(A) B-rep method

(B)STL method

(C)CSG method

(D)PRT method.

45.STL file converts curved surfaces into_____.

(A)Polygons

(B) Lines

(C)Surfaces

(D)None of the above

46.STL File Problems

(A) GAPS

(B) Degenerate facets

(C)Overlapping Facets

(D)All of the above

47.STL file converts curved surfaces into_____.

(A)Polygons

(B) Lines

(C)Surfaces

(D)None of the above

48. 3D reserved section of an SLC file consists of how many bytes?

(A) 256

(B) 512

(C) 1024

(D) 2048

49. Rensselaer Design Research Center has developed which of the following format?

(A) Computerized Tomography

(B) StereoLithography Contour

(C) Common Layer Interface

(D) Rapid Prototyping Interface

50. In RPI format, facet models are more efficiently represented as _____.

(A) redundancy is reduced

(B) redundancy is increased

(C) redundancy is zero

(D) redundancy is infinite

From following, the alternative name for RP is _____

(A) Additive Manufacturing

(B) Layer Manufacturing

(C) Direct CAD Manufacturing

(D) All of the above

The process of obtaining a geometric CAD model from 3D points acquired by scanning/digitizing existing parts/products is best known as:

Forward Engineering

Backward Engineering

Reverse Engineering

Product Engineering

In the entire reverse engineering process for product design, which one is the first step?

(A) CAD model updating

(B) CAD modeling

(C) Data pre-processing

(D) Data capturing

Which kind of laser is used to cut the sheets in LOM?

Ruby Laser

Carbon Dioxide Laser

He-Ne Laser

FDM build plates are prepared by...

a) Putting hair spray on it

b) Putting a layer of painters tape on it

c) Putting a glue stick layer on it

d) All the above

Which of the following does NOT influence how refined the 3D printed part will be?

a) Layer thickness

b) Using support material

c) Part orientation

d) All the above

Which should be considered when orienting the part on the build plate in the slicing software?

a) Holes should always be printed horizontally

b) The footprint of the part should be as small as possible

c) You should minimize the number of overhangs

d) All of the above

SLA printer's package material is in a...

a) Chain

b) Spool

c) Cartridge

d) None of the above

Which type of printer uses an enclosed build area?

a) SLA

b) SLS

c) MDS

d) FDM

Which of the following is typically the most expensive type of 3D printer?

a) SLA

b) SLM

c) FDM

d) None of the above

1. _____ split the 3-D object into a few chunks of material (V-slices) which are automatically machinable from two opposite directions.
a) Laser powder based fusion b) Segmented object manufacturing c) Selective laser sintering d) Direct metal laser sintering
2. Which among the following is a non-laminated manufacturing process?
a) Hybrid layered manufacturing   b) Directed light fabrication c) Direct metal laser sintering   d) Laser additive manufacturing
3. In which method prototype gets built inside liquid photopolymer and hence there is no possibility of using another material as support?
a) SLA   b) SLM   c) FDM   d) LOM
4. No post curing is required for the parts printed using _____.
a) Stereolithography   b) Fused deposition   c) Selective laser melting   d) Direct energy deposition
5. The parts manufactured by using _____ are porous in nature.
a) FDM   b) LOM   c) SLM   d) SLS.
6. Why do you need to caliberate the 3D printer?
a) So that the nozzle isn't too low   b) So that the nozzle isn't too high   c) So that the job prints properly   d) All of the above
7. Who is known as the father of 3D printing?
a)   b)Chuck Hull   c)   d) Jacob Adams
8. In 4D printing, which one is the fourth dimension?
a) Time   b) Material   c) Sound   d) Light
9. Laminated object manufacturing is developed by _____.
a) Stratasys   b) 3D systems c) Kira Corporation   d) Cubic Technologies
10. Direct Tooling is technically equivalent to _____.
a) Direct Costing   b) Direct Manufacturing   c) Indirect production d) All of the above
11. Which of the following aspect is mainly concerned with moulding the final shape around the basic skeleton?
a) Functional aspect   b) Operational aspect c) Aesthetic aspect   d) None of the above
12. Gold and silver are mostly process in the form in 3D printing?
a) Powdered   b) Liquid   c) Solidified or granular   d) None of the above
13. The 3D printing material aluminide is a combination of powdered Aluminium and _____.
a) Nylon   b) Polyester   c) Silver   d) Polypropylene
14. What is the part of 3D printing in tissue engineering?
a) Printing a live tissue   b) Prototyping the tissue   c) Printing artificial scaffoldings to grow tissue on   d) All of the above
15. Which of the following is a possible application of 4d printing?
a) Smart water pipes   b) Superior sound system   c) Ready-made electronic devices   d) All of the above

16. What are the positive environmental effects of 3D printing in comparison to traditional fabrication methods?
a) Production is done closer to the consumer replacing shipping carbon footprint b) Used less support material thus produces less waste.   c) Increases product sustainability and enable more moderate consumption patterns of spares   d) All of the above
17. Which of the following is true? I. Certain food products, such as chocolate can be 3D printed.   II. 3d printing make more accurate with composition of chocolates.
a) Only I   b) Only II   c) Neither I nor II   c) both I or II
18. Ultrasonic additive manufacturing is hybrid sheet lamination process combining_____.
a) Ultrasonic spot welding + CNC milling   b) Ultrasonic spot welding + CNC turning   c) Ultrasonic seam welding + CNC milling   d) Ultrasonic seam welding + CNC turning
19. Which of the following is an additive plus subtractive process?
a) 3D printing b) LOM   c) LENS d) UAM
20. What is a current capability of 3D bioprinting?
a) Printing tissues samples for use in drug testing   b) printing small organs like ears of bones c) Printing complex, functional organs like hearts and kidneys   d) All of the above
21. Which of the following is not liquid based RP system?
a) SLA   b) LOM   c) SGC   d) SOUP (solid object ultraviolet laser printer)
22. Solid ground curing (SGC) is developed by _____.
a) 3D systems   b) Sony   c) CMET   d) Cubital
23. Which of the following is not solid based RP system?
a) LOM   b) PLT (paper Laminated Technology)   c) EBM   d) FDM
24. Which of the following is not powder based RP system?
a) SLS   b) SOUP   c) EBM   d) DMD (Direct Metal Deposition)
25. Electron Beam melting is developed by _____.
a) ACRAM   b) 3D systems c) Z corporation   d) Optomec

Descriptive questions:

1. Enlist different types of additive manufacturing technologies.
2. Define 3D printing with suitable examples.
3. Explain the role of CAD in Additive Manufacturing.
4. What is photo polymerization?
5. Differentiate between both geometry and topography.
6. What is a STL file?
7. Enlist and define two software's used to assist Additive Manufacturing.
8. How AM helps in aerospace and biomedical applications?
9. Differentiate both AM and CNC machining.
10. Enlist the advantages and disadvantages of Additive Manufacturing.
11. Describe in detail about the steps involved in Additive Manufacturing.
12. Define powder bed fusion process of Additive Manufacturing.
13. What is the consequence of building a valid tessellated model?
14. Mention RP applications in the automotive industry.
15. Compare and explain the differences, both conventional machining and RP.

16. Explain with a neat sketch the working principle of stereo-lithography (SLA) process with advantages and its limitations.
17. Describe the process of fused deposition modeling and list the factors that affect the part quality.
18. Write note on Hybrid layered manufacturing.
19. Discuss the basic principle of the extrusion-based Additive Manufacturing processes.
20. Write short notes on "Ultrasonic Additive Manufacturing".
21. Write short notes on ink based direct write technology.
22. Discuss the major software related problems associated with Additive Manufacturing.
23. Discuss in detail about the problems associated with STL files used in Additive Manufacturing.
24. Discuss in detail about the use of Additive Manufacturing to support medical applications with its limitations.
25. With an example, discuss the type of mfg. available for Additive Manufacturing and their suitability in product development.
26. What is the need for Additive manufacturing?
27. Give a short note on photopolymers.
28. Briefly write the prominence of Laminated object manufacturing.
29. Discuss solid state sintering and chemically induced sintering with suitable examples.
30. What is DFAM? Discuss the core DFAM concept and objectives.
31. How to eliminate the DFM constraints?
32. Discuss the aspect of product development in Additive Manufacturing.
33. What are the future and business opportunities in industry using Additive Manufacturing?
34. Differentiate both virtual and digital prototyping.
35. Explain the evolution of RP to additive mfg.}
36. Discuss the importance of Layered manufacturing process.
37. Discuss polymerization, sintering and melting with suitable examples.
38. Explain in detail the process chain of additive manufacturing. (10 Marks)
39. Explain with a neat sketch the working principle of Stereo-lithography (SLA) process(08 Marks.
40. Explain in detail post processing of additive manufacturing parts.(10 Marks)
    Explain the applications of AM in various fields. (6 Marks)
41. Explain with a neat sketch the working principle of Selective Laser Sintering process (08 Marks)
42. Explain with a neat sketch the working principle ofLOM process. (08Marks)
43. Enumerate the application of shape memory alloys as actuators in additive manufacturing process. (06Marks)
44. List any four different materials used in additive manufacturing technology.
45. What is known as Staircase effect in model building? Explain.
46. Describe any two CAD models used in Additive manugacturing Technology.
47. What are the limitations of SLA process and how are they modified?
48. List any four applications of Laminated Object Manufacturing.
49. What is the significance of net shaping in LENS process?
50. Explain how AMT is used for orthopaedic applications?
51. What is mean by Tissue Engineering?
52. Explain with suitable flow diagram how the AMT is applied for maxillofacial dental applications for a patient. Draw necessary sketches.
53. Explain the advantages, algorithms, and applications of the softwares MIMICS AND MAGICS used in AMT.
54. Draw suitable sketch and explain how a product is made using SLA process?

55. Explain the functioning of FDM process model and how the part orientation is carried out?
56. Explain the principle, process advantages and applications of 3 D printing.
57. Discuss on how a metallic die of pressure die casting is made by using SLS process.
58. Compare the process features, advantages, applications and limitations of LENS and EBM process.
59. Discuss on why AMT is more advantageous for some applications than conventional machining and vice-versa.
60. Explain the SLA process with a neat sketch. Mention its advantages, limitations and applications.
61. Describe the FDM process with a suitable example.