Q5) a) Explain the design considerations of different types of nozzles used in Polymer based 3D Printers. **[9]**

b) Explain the design considerations of Positioning Devices and Scanners System used in Laser-Based Metal 3D Printers. **[8]**

OR

Q6) a) Explain the process and mechanism used in Multi-Jet modeling (MJM). **[9]**

b) What is calibration of 3D Printer? Explain the steps in details. **[8]**

Q7) a) Explain how additive manufacturing is used in Electronics Industries. Also write merits, demerits and practical feasible applications with illustrations. **[9]**

b) Write a short note on 4D Printing and 5D Printing and its applications. **[9]**

OR

Q8) a) Explain how additive manufacturing is used in Assistive Devices Sector. Also write merits, demerits and practical feasible applications with illustrations. **[9]**

b) Write use, method and application of bio printing. Explain with example of case studies additive manufacturing in aerospace and machine tools. **[9]**

Total No. of Questions : 8]

SEAT No. :

P6673

[Total No. of Pages : 2

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B.E. (Mechanical Engineering)

ADDITIVE MANUFACTURING

(2019 Pattern) (Semester - VII) (Elective - IV) (402045 C) (Theory)

Time : 2 ½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data wherever necessary.*

Q1) a) Explain process Fused Filament Fabrication (FFF) with suitable sketch. **[9]**

b) Explain process Bio-printing with suitable sketch. **[9]**

OR

Q2) a) Explain process Direct Ink Writing (DIW) with suitable sketch. **[9]**

b) Explain process Direct Metal Deposition (DMD) with suitable sketch. **[9]**

Q3) a) Explain the materials used in 4D Printing with important process Parameters, benefits, Limitations and appropriate applications. **[9]**

b) Explain varieties of chemical treatment applied in pre- and post-processing of additive manufacturing based products. **[8]**

OR

Q4) a) Explain Robocasting and Bio printing with suitable example. **[9]**

b) Explain use of Ceramics in Additive Manufacturing with important process parameters, benefits, Limitations and appropriate applications. **[8]**

P.T.O.

Total No. of Questions : 8]

SEAT No. :

P-8685

[Total No. of Pages : 2

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B.E. (Mechanical Engineering) (Sandwich)

ADDITIVE MANUFACTURING

(2019 Pattern) (Semester - VIII) (402045C) (Elective - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*

Q1) a) Explain the working principle of fused deposition modelling with neat sketch. Discuss the possible defects in this method. **[9]**

b) Explain the printing mechanism involved in direct ink writing with neat sketch. Give their advantages and applications. **[9]**

OR

Q2) a) Explain Direct metal deposition. List its Benefits and Limitations. **[9]**

b) Explain the process polyjet printing. Also write the applications, merits and demerits. **[9]**

Q3) a) Explain the post processing steps involved in powder based additive manufacturing. **[9]**

b) Explain with an example how the material and the additive manufacturing method can be selected for various applications. **[8]**

OR

Q4) a) Discuss the various techniques used to enhance the surface properties of additively manufactured parts. **[8]**

b) Explain the various design considerations/rules involved in additive manufacturing with the help suitable sketch. **[9]**

P.T.O.

Q5) a) Define slicing and their types. Explain the various infill strategies used for area filling the sliced model. **[9]**

b) Explain the construction details of 3D printers. **[9]**

OR

Q6) a) Explain the construction of 3D printers. List their advantages and applications. **[9]**

b) Explain the steps followed while slicing a CAD model in slicing software Explain the construction of extrusion based printers. **[9]**

Q7) a) Discuss the benefits of additive manufacturing in the research and development sector. **[9]**

b) Discuss a case study on how the performance of automobile parts can be improved by adopting additive manufacturing. **[8]**

OR

Q8) a) How additive manufacturing can influence the mass customization? Explain in detail mentioning its future trends. **[9]**

b) Discuss the application of 3D printing in art. fashion and Jewellery industry. **[8]**

Savitribai Phule Pune University				
Department of Mechanical Engineering				
Unit 6 : Case Studies, Application and Special Topics - Theory Question Bank				
Subject: Additive Manufacturing [402045C]				Class: BE
Sr. No.	Question Statement	CO	BL	Marks
1	Explain how additive manufacturing is used in Automotive Industries. Also write merits, demerits and practical feasible applications with illustrations.	6	2, 6	09
2	Explain how additive manufacturing is used in Assistive Devices Sector. Also write merits, demerits and practical feasible applications with illustrations.	6	2, 6	09
3	What is 4D Printing? Explain and illustrate its applications.	6	2, 6	08
4	What is 5D Printing? Explain and illustrate its applications.	6	2, 6	08
5	What is Bio-printing? Explain and illustrate its applications.	6	2, 6	08
6	What are the Bio-materials? Explain and illustrate their applications.	6	2, 6	08
7	Explain the Trends in 3D Printing Mass Customization.	6	2, 6	08
8	Explain how additive manufacturing is used in Jewelry Sector. Also write merits, demerits and practical feasible applications with illustrations.	6	2, 6	09
9	Explain how additive manufacturing is used in Bio-medical Applications. Also write merits, demerits and practical feasible applications with illustrations.	6	2, 6	09
10	Explain how additive manufacturing is used in Aerospace Industries. Also write merits, demerits and practical feasible applications with illustrations.	6	2, 6	09

Savitribai Phule Pune University				
Department of Mechanical Engineering				
Unit 3 : Extrusion and energy based Techniques - Theory Question Bank				
Subject: Additive Manufacturing [402045C]				Class: BE
Sr. No.	Question Statement	CO	BL	Marks
1	Explain the process of Fused Deposition Modeling (FDM) with suitable sketch. Also write merits, demerits and applications.	3	2, 6	09
2	Explain the process of Direct Metal Deposition (DMD) with suitable sketch. Also write merits, demerits and applications.	3	2, 6	09
3	Explain the process of Robocasting with suitable sketch. Also write merits, demerits and applications.	3	2, 6	08
4	Describe with neat sketch the Direct Ink Writing (DIW) technique and process physics associated with it.	3	2, 6	08
5	Explain Bio-printing with principle, construction and working with suitable sketch.	3	2, 6	08
6	Explain the process of Polyjet Printing with suitable sketch. Also write merits, demerits and applications.	3	2, 6	09
7	Explain the process of Binder Jetting with suitable sketch. Also write merits, demerits and applications.	3	2, 6	09
8	Explain the process of Electron Beam-based DED with suitable sketch. Also write merits, demerits and applications.	3	2, 6	09
9	Explain the process of Direct Metal Deposition (DMD) with suitable sketch. Also write merits, demerits and applications.	3	2, 6	09
10	Explain the process of Multi-jet Modeling (MJM) with suitable sketch. Also write merits, demerits and applications.	3	2, 6	09

Savitribai Phule Pune University
Department of Mechanical Engineering

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Unit 4 : Materials and Design for AM - Theory Question Bank				
Subject: Additive Manufacturing [402045C]				Class: BE
Sr. No.	Question Statement	CO	BL	Marks
1	What is DFAM? What are the rules and recommendations for DFAM?	4	2, 6	08
2	Explain types of material used in Additive Manufacturing. Also write merits, demerits and application.	4	2, 6	09
3	Discuss the significance of Surface enhancement Techniques in AM. Explain any two Surface enhancement Techniques.	4	2, 6	09
4	What are the different types of post processing techniques in AM? Why post processing is necessary in additive manufacturing?	4	2, 6	09
5	Explain phase transformation in AM.	4	2, 6	08
6	Explain the materials used in 4D Printing with important process parameters, benefits, drawbacks, Limitations and appropriate applications.	4	2, 6	09
7	Explain use of Shape-Memory Alloys in Additive Manufacturing with important process parameters, benefits, drawbacks, Limitations and appropriate applications.	4	2, 6	09
8	Explain use of Biomimetic Materials in Additive Manufacturing with important process parameters, benefits, drawbacks, Limitations and appropriate applications.	4	2, 6	09
9	Explain the criteria of material selection in Additive Manufacturing with suitable examples.	4	2, 6	09
10	Explain varieties of heat treatment applied in pre- and post-processing of additive manufacturing based products.	4	2, 6	08

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Department of Mechanical Engineering				
Unit 5 : Hardware and Software for AM - Theory Question Bank				
Subject: Additive Manufacturing [402045C]				Class: BE
Sr. No.	Question Statement	CO	BL	Marks

Savitribai Phule Pune University				
Department of Mechanical Engineering				
Unit 5 : Hardware and Software for AM - Theory Question Bank				
Subject: Additive Manufacturing [402045C]				Class: BE
Sr. No.	Question Statement	CO	BL	Marks
1	Describe any four Preparatory function [G code] and any four Miscellaneous function [M code] used in additive manufacturing.	5	2, 6	08
2	What are the different types of Types of in-fill pattern? Describe in details.	5	2, 6	09
3	Explain and illustrate the different types of slicing and path planning.	5	2, 6	09
4	Explain the design considerations of Powder Bed Spreading Mechanisms also known as recoater system used in Metal based 3D Printers.	5	2, 6	09
5	Explain the Construction, Layout and sub-system of Fused Deposition Modeling [FDM] process based 3D Printers.	5	2, 6	08
6	Explain the classification of Equipment Topology/Layout Frame Designs used in 3D Printers with illustrations.	5	2, 6	09
7	Explain the Construction, Layout and sub-system of Selective Laser Sintering [SLS] process based 3D Printers.	5	2, 6	08
8	Explain Cold end and hot end of Extruders used in Polymer based 3D Printers.	5	2, 6	08
9	Explain the design considerations of different types of nozzles used in Polymer based 3D Printers.	5	2, 6	08
10	Explain function of gas circulation system, powder handling system and base plate in 3D printer.	5	2, 6	08

Savitribai Phule Pune University				
Department of Mechanical Engineering				
Unit 6 : Case Studies, Application and Special Topics - Theory Question Bank				
Subject: Additive Manufacturing [402045C]				Class: BE
Sr. No.	Question Statement	CO	BL	Marks
1	Explain how additive manufacturing is used in Automotive	6	2, 6	09