Q. Code: 708726

Reg. No. | | | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATION, MAY 2023

Sixth Semester

ME18002 – 3D PRINTING AND DESIGN

(Mechanical Engineering)

(Regulation 2018)

TIME: 3 HOURS **MAX. MARKS: 100**

CO 1 Students will be able to understand the principles of AM, file conversion, and STL file structure.

CO 2 Students will be able to understand various additive manufacturing (AM) processes and the process parameters and calculate the build time.

CO 3 Students will be able to understand the various design requirements for Additive Manufacturing.

CO 4 Students will be able to understand various post-processing methods in AM and select suitable property enhancement techniques.

CO5 Students will be able to explain various applications of AM in various fields.

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Justify the need for additive manufacturing technology.	**1**	**2**
2.	What are the attributes of AM?	**1**	**1**
3.	Why the parts are made from LENS process denser compared to parts made from SLS?	**2**	**2**
4.	Parts built with the FDM process usually have restricted accuracy. Justify your answer.	**2**	**3**
5.	Differentiate between low-end and high-end post-processing.	**3**	**4**
6.	A designer needs an AM process for making concept models. The cost of the machine is of concern. He is willing to accept the poor surface finish. Among LOM and SLA machines which one will you choose. Justify your answer.	**3**	**3**
7.	An inclined surface is machined using a ball nose end mill cutter. The details of the machining are: radius of the cutter = 9 mm, cusp height = 1 mm, angle of the surface = 40°. Calculate the step over distance.	**4**	**3**
8.	When do you use Abrasive flow machining process?	**4**	**3**
9.	Differentiate between soft-tooling and hard-tooling.	**5**	**3**
10.	What are the AM processes which can produce Direct Rapid Prototyped Tooling? Justify your answer.	**5**	**3**

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	Elaborate on how reverse engineering helps AM process.	**(7)**	**1**	**2**
	(ii)	Distinguish between CNC machines and additive manufacturing.	**(7)**	**1**	**4**
		(OR)			
(b)	**(i)**	Explain the generic additive manufacturing process.	**(7)**	**1**	**2**

	(ii)	What are the attributes of AM? Briefly explain each one of them.	**(7)**	**1**	**2**
12. (a)	**(i)**	Explain the FDM process with a neat sketch.	**(7)**	**2**	**2**
	(ii)	Various process parameters used in FDM process affect the build time, dimensional accuracy and surface finish. Discuss on this.	**(7)**	**2**	**2**
		(OR)			
(b)	**(i)**	Give the principle behind the SLA process. Describe the SLA process with a neat sketch.	**(7)**	**2**	**2**
	(ii)	Various process parameters used in SLA process affect the build time, dimensional accuracy and surface finish. Discuss on this.	**(7)**	**2**	**2**
13. (a)	**(i)**	Explain part orientation and removal of supports.	**(7)**	**3**	**2**
	(ii)	Explain hollowing out parts and interlocking features.	**(7)**	**3**	**2**
		(OR)			
(b)		What are the unique capabilities of the AM process? Write in detail on them.	**(14)**	**3**	**2**
14. (a)	**(i)**	Describe the process of removing the synthetic support in additive manufacturing.	**(7)**	**4**	**2**
	(ii)	Discuss on sharp edge contour machining and hole drilling.	**(7)**	**4**	**2**
		(OR)			
(b)	**(i)**	Explain the RTV molding or Silicone Rubber Molding process with a suitable sketch.	**(7)**	**4**	**2**
	(ii)	Discuss the technique of the metal spray process with a simple sketch.	**(7)**	**4**	**2**
15. (a)	**(i)**	Explain the process of building medical models.	**(7)**	**5**	**2**
	(ii)	Discuss on rapid tooling and direct rapid prototyped tooling.	**(7)**	**5**	**2**
		(OR)			
(b)	**(i)**	Write short notes on bi-metallic parts and remanufacturing.	**(7)**	**5**	**2**
	(ii)	Discuss the new materials development that is taking place in AM applications.	**(7)**	**5**	**2**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

			Marks	CO	RBT LEVEL
16.		A component in the shape of a cuboid must be built using an SLA machine. The cross-section has a length of 500 mm and a width of 300 mm; the height of the cuboid is 400 mm. The layer thickness is 1 mm. The diameter of the laser is 10 mm. The scanning speed is 50 mm/s. Calculate the time taken to build the component.	**(10)**	**2**	**3**