Reg. No.																

Question Paper Code	13189

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Seventh Semester

Mechanical Engineering

20MEPW701 - 3D PRINTING AND SUSTAINABLE DESIGN WITH LABORATORY

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which of the following statement is not correct (a) SLM is most expensive type of 3D printer (b) PVC material is used in 3D Printer (c) Stereo-lithography is not subtractive process (d) Titanium is used in Industrial grade 3D Printers	1	K1	CO1
2.	Which type of 3D printer uses a pool of resin to create the solid part? (a) FDM (b) SLA (c) SNL (d) None of the above	1	K1	CO1
3.	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	1	K1	CO1
4.	What is the main advantage of 3D printing over traditional manufacturing methods? (a) Lower cost (b) Faster production speed (c) Ability to create complex geometries (d) More durable materials	1	K1	CO1
5.	Which of the following is not subtractive process? (a) Milling (b)Stereo-lithography (c) Sawing (d)EDM	1	K1	CO2
6.	What is the term for the resolution or layer thickness of a 3D-printed object? (a) Fidelity (b) Tolerance (c) Resolution (d) Accuracy	1	K1	CO2
7.	Which of the following is least important in design during rapid prototyping? (a) Machine size (b) Tolerance (c) Material (d) CAD software	1	K1	CO2
8.	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	1	K1	CO2
9.	STL file format is represented by interaction of _____. (a) lines and hexagons (b) lines and rectangles (c) lines and triangles (d) lines and circles	1	K1	CO3
10.	Direct Tooling is technically equivalent to: (a) Direct Costing (b) Direct Manufacturing (c) Indirect Production (d)None of these	1	K1	CO3
11.	In hybrid additive manufacturing, what is the purpose of the subtractive process? (a) To remove excess material after the additive process (b) To create the base structure for the additive process (c) To enhance the mechanical properties of the final product (d) To control the temperature of the additive process	1	K1	CO3
12.	SLM stands for ___ in RP process (a) Selective Laser Melting (c) Selective Light Melting (b) Sintering Laser Melting (d) Sintering Laser Manufacturing	1	K1	CO3
13.	Which of the following is an example of a sustainable productivity practice? (a) Using non-renewable resources for production (b) Increasing production speed at the expense of environmental impact (c) Recycling waste materials from production processes (d) Ignoring the social impact of production processes	1	K1	CO4

14. What is the goal of product life cycle assessment (LCA)? *1 K1 CO4*
(a) To evaluate the environmental, economic, and social impacts of a product throughout its life cycle
(b) To evaluate the economic impacts of a product throughout its life cycle
(c) To evaluate the social impacts of a product throughout its life cycle
(d) To evaluate the environmental impacts of a product only during the production phase

15. What is a sustainability audit? *1 K1 CO4*
(a) An assessment of a company's sustainability performance and practices
(b) An assessment of a product's sustainability performance throughout its life cycle
(c) An assessment of a company's profitability
(d) An assessment of a product's aesthetics

16. What is the main focus of environmental sustainability? *1 K1 CO4*
(a) To prioritize economic development over social and environmental needs
(b) To protect the environment at any cost
(c) To balance economic and social needs with the protection of the environment
(d) To prioritize social justice over economic and environmental needs

17. Which of the following industries is most suited to demanufacturing? *1 K1 CO5*
(a) Fast fashion (b) Electronics (c) Food and beverage (d) Automotive

18. What is the first step in cleaner production? *1 K1 CO5*
(a) Collecting data on the manufacturing process (c) Designing new products
(b) Conducting a market analysis (d) Hiring a consulting firm

19. What are some of the challenges in implementing Sustainable Product-Service Systems? *1 K1 CO5*
(a) Resistance to change from consumers and companies
(b) Lack of government policies and incentives to promote sustainability
(c) Limited availability of sustainable materials and technologies
(d) All of the mentioned

20. Which of the following is an example of a Sustainable Product-Service System design strategy? *1 K1 CO5*
(a) Offering more products to customers
(b) Making products that are easier to dispose of
(c) Designing products that are modular and can be easily repaired or upgraded
(d) Using more non-renewable resources in the production process

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21. State the importance of the overview in understanding 3D printing technology. *2 K1 CO1*
22. Provide an example of using 3D printing for disaster management. *2 K2 CO1*
23. Define "support structure" in the context of additive manufacturing. *2 K1 CO2*
24. Summarize the factors affecting the part orientation. *2 K2 CO2*
25. State the merits and demerits of steriolithography. *2 K1 CO3*
26. Describe the primary materials used in Laminated Object Manufacturing (LOM). *2 K2 CO3*
27. Define sustainability and sustainable development in the context of design. *2 K1 CO4*
28. Explain are the principles of Design for Sustainability. *2 K2 CO4*
29. Define Sustainable Product-Service System (PSS) design. *2 K1 CO5*
30. Summarize the environmental and energy benefits of remanufacuting. *2 K2 CO5*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31. a) Explain in detail about the Material Extrusion process with suitable diagram. *10 K2 CO1*

OR

b) Summarize the use of 3D printing on the aerospace industry's transition to Industry 4.0. *10 K2 CO1*

32.	a)	What are the geometric modelling techniques? Explain in detail about solid modelling.	*10*	*K2*	*CO2*
		OR			
	b)	With suitable diagram explain the types of support structures used in additive manufacturing.	*10*	*K2*	*CO2*
33.	a)	Explore the working principles behind Laser Engineered Net Shaping (LENS) and its significance in the aerospace and medical industries.	*10*	*K2*	*CO3*
		OR			
	b)	Explain the concept of wire arc additive manufacturing in 3D with suitable diagram.	*10*	*K2*	*CO3*
34.	a)	Explain the key components of the pathway to achieving sustainability in design.	*10*	*K2*	*CO4*
		OR			
	b)	Briefly discuss any four sustainable development goals and how it is related to 3D Printing technique with suitable example.	*10*	*K2*	*CO4*
35.	a)	Explain in detail about design for sustainability principles.	*10*	*K2*	*CO5*
		OR			
	b)	Define life cycle assessment techniques. Explain the four steps involved in life cycle assessment with suitable diagram.	*10*	*K2*	*CO5*
36.	a) i)	What are the types of Support Structures? Explain any one with suitable diagram.	*5*	*K2*	*CO2*
	ii)	Summarize the key components and explain the process involved in Solid Ground Curing (SGC).	*5*	*K2*	*CO3*
		OR			
	b) i)	Explain the surface entities in geometric modelling.	*5*	*K2*	*CO2*
	ii)	Compare the advantages of FDM with LOM.	*5*	*K2*	*CO3*