C–7527

Sub. Code
60531

B.Voc. DEGREE EXAMINATION, APRIL 2026

Third Semester

Manufacturing Technology

INTRODUCTION TO DIGITAL MANUFACTURING

(2023 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. CAM (Computer-Aided Manufacturing) focuses on:

   (a) Creating financial models

   (b) Generating production instructions for machines

   (c) Optimizing ergonomic designs

   (d) Managing product lifecycle

2. Which of the following is a function of a PLM (Product Lifecycle Management) system?

   (a) Managing production schedules

   (b) Direct control of machine tools

   (c) Storing and tracking product data throughout its lifecycle

   (d) Real-time monitoring of energy usage

3. Which of the following is a building block of the Fourth Industrial Revolution?

(a) Big Data and Analytics

(b) Handwritten records

(c) Pneumatic systems

(d) Analog communication

4. Which of the following is NOT a key component of Industry 4.0?

(a) Internet of Things (IoT)

(b) Artificial Intelligence (AI)

(c) Steam-powered machinery

(d) Cyber-Physical Systems (CPS)

5. Which of the following is an application of augmented reality (AR) in manufacturing?

(a) Virtual product prototyping

(b) Overlaying digital instructions on physical equipment for enhanced understanding

(c) Controlling robots manually

(d) Designing physical blueprints

6. Big Data analysis in reconfigurable manufacturing system helps

(a) Improve manual labor productivity

(b) Provide insights for process improvement and customization

(c) Reduce the need for advanced technologies

(d) Limit the scalability of production systems

7. What role does artificial intelligence play in manufacturing?

(a) Replacing all human workers

(b) Eliminating the need for IoT systems

(c) Enhancing decision-making and process optimization

(d) Increasing reliance on manual processes

8. Machine learning in manufacturing processes is primarily used for:

(a) Manual control of machinery

(b) Predicting system failures and optimizing production

(c) Designing user interfaces

(d) Limiting automation in manufacturing

9. Which of the following technologies is essential for building future smart supply chains?

(a) Steam-powered engines

(b) Analog communication systems

(c) Pneumatic transport systems

(d) Internet of Things (IoT) and blockchain

10. Which of these is a common obstacle to implementing smart supply chains?

(a) Data security concerns and integration complexity

(b) Availability of advanced technologies

(c) Lack of interest in automation

(d) Over-reliance on digital systems

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Describe the purpose and importance of CAPP (Computer-Aided Process Planning) in digital manufacturing.

Or

(b) Analyze the role of factory layout planning in optimizing manufacturing operations.

12. (a) Compare and contrast the characteristics of a "Today Factory" with an Industry 4.0 factory.

Or

(b) Analyze the impact of industry 4.0 on the manufacturing value chain.

13. (a) Discuss how emerging technologies, such as AI, IoT, and AR, are transforming the design phase in manufacturing.

Or

(b) Examine the role of IoT-enabled systems in enhancing real-time monitoring and control in manufacturing.

14. (a) How do big data analytics and machine learning work together to improve decision-making in reconfigurable manufacturing systems?

Or

(b) Discuss the ethical and social implications of adopting AI and machine learning in manufacturing.

15. (a) Discuss the primary challenges of digital transformation in manufacturing.

Or

(b) Analyze how new and successful business models, such as servitization and mass customization, are shaping the future of digital manufacturing.

Part C (5 × 8 = 40)

Answer **all** questions, choosing either (a) or (b).

16. (a) Explain the concept and functionality of PLM (Product Lifecycle Management) systems. How do PLM systems contribute to the overall success of digital manufacturing?

Or

(b) Evaluate the role of CAP (Computer-Aided Engineering) in analyzing and optimizing product designs.

17. (a) Evaluate the role of cyber-physical systems (CPS) in Industry 4.0

Or

(b) Discuss the socio-economic implications of Industry 4.0.

18. (a) How are AR and VR revolutionizing training programs in the manufacturing industry? Discuss their advantages over traditional training methods.

Or

(b) Analyze the challenges and opportunities associated with integrating collaborative robots into existing manufacturing and Logistics systems.

19. (a) Discuss the potential of additive manufacturing in reshaping supply chains and logistics. How does it enable decentralized production and reduce lead times?

Or

(b) 'Evaluate the role of virtual reality (VR) in improving the accuracy and efficiency of manufacturing system simulations.

20. (a) Examine the socio-economic implications of digital transformation in manufacturing.

Or

(b) Explore the role of digital twins and simulation technologies in the future of digital manufacturing.

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C–7529	Sub. Code 60566

B.Voc. DEGREE EXAMINATION, APRIL 2026

Sixth Semester

Manufacturing Technology

MICRO AND NANO MANUFACTURING PROCESSES

(2023 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. In micro-crystalline materials, the size of the crystallites typically falls within the range of

   (a) 1 to 100 nm

   (b) 100 to 1000 nm

   (c) 1 to 100 micrometers

   (d) 100 to 1000 micrometers

2. The primary method of synthesizing nano-crystalline materials is

   (a) Ball milling or mechanical alloying

   (b) High- temperature sintering

   (c) Ion implantation

   (d) Vapor deposition

3. Which of the following is a bottom-up method for nanomaterial synthesis?

(a) Milling

(b) Laser ablation

(c) Chemical vapor deposition

(d) Mechanical grinding

4. Which of the following is a top-down technique?

(a) Atomic layer deposition

(b) Ball milling

(c) Molecular self-assembly

(d) Sol-gel synthesis

5. The technique uses the interaction of an electron beam with a sample surface to generate high-resolution images is

(a) SEM

(b) TEM

(c) XRD

(d) FTIR

6. In Atomic Force Microscopy (AFM), the image is formed by

(a) scattering of X-rays

(b) tunnelling current between the probe and sample

(c) measuring the force between a sharp tip and sample surface

(d) diffraction pattern of electrons

7. Nanomaterials used in aerospace structures because of

(a) High electrical conductivity

(b) Lightweight and high strength

(c) High thermal conductivity

(d) Magnetic properties

8. Nanomaterials are used in drug delivery systems primarily because of their

(a) Large surface area and targeted delivery capability

(b) Magnetic properties

(c) Ability to improve blood flow

(d) High cost-effectiveness

9. The acronym LIGA stand for

(a) Lithography, Ion Beam, Galvanization

(b) Laser Induced Galvanization

(c) Lithography, Electroplating, and Molding

(d) Lithography, Imaging and Graphical Assembly

10. The minimum feature size that can be achieved with submicron lithography is

(a) 10 micrometres

(b) 1 micrometre

(c) 100 nanometres

(d) 10 nanometres

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Classify nanomaterials based on their size, shape, and dimensionality.

Or

(b) Explain the difference between amorphous and crystalline materials with respect to their atomic structure and properties.

12. (a) Explain the difference between the top-down and bottom-up methods for nanoparticle production.

Or

(b) Explain the sol-gel method for nanoparticle production.

13. (a) What are the common challenges and issues in characterizing nanomaterials.

Or

(b) Illustrate the principle involved in atomic force microscopy.

14. (a) Discuss the application of nano materials in the field of mechanical & electronics industry.

Or

(b) Brief the various use of nano materials in the field of automobile and aerospace industry

15. (a) Compare the advantages and disadvantages of submicron lithographic techniques versus conventional film growth methods.

Or

(b) Compare the precision of Ion Beam Etching (IBE) with that of chemical etching..

Part C (5 × 8 = 40)

Answer **all** questions, choosing either (a) or (b).

16. (a) Classify the following materials as either amorphous, crystalline, micro, quasi, nano crystalline: (i) Glass, (ii) Gold nanoparticles, (iii) Graphite, (iv) Aluminum-copper-iron alloy, (v) Silicon wafer. Discuss the characteristics of each type and its applications.

Or

(b) Brief on optical, magnetic, and acoustic properties of various nano materials.

17. (a) Enumerate the process of synthesis of carbon nano tubes through solid carbon-based production techniques

Or

(b) Compare the process of physical and chemical vapour deposition.

18. (a) Describe the principle and working of scanning transmission electron microscopy in the characterization of nanomaterials.

Or

(b) Explain the principles behind dynamic and magnetic force microscopy.

19. (a) Define organic and ceramic nanomaterials. Explain the properties of the same that make them suitable for applications in various industries.

Or

(b) List the various types of nanomaterials used in medical & defence applications and briefly describe their primary functions.

20. (a) Demonstrate how conventional film growth techniques, such as sputtering are used to deposit thin metallic films for various applications.

Or

(b) Compare the scalability of top-down and bottom-up nanofabrication techniques. Discuss the limitations and advantages of the same.

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