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Question Paper Code	14231
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B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Fourth Semester

Mechanical Engineering

20MEPC403 - COMPUTER AIDED DESIGN AND MANUFACTURING

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

	<i>Marks</i>	<i>K- Level</i>	<i>CO</i>
1. The main objective of the product cycle is to (a) Minimize product cost only (b) Define stages from conception to disposal (c) Focus only on manufacturing (d) Limit product lifetime	1	K2	CO1
2. Viewing transformation is applied to (a) Convert world coordinates to screen coordinates (b) Define object material properties (c) Control animation speed (d) Calculate machining parameters	1	K2	CO1
3. Hermite curves are defined by (a) End points and tangent vectors at the ends (b) Only control points (c) Midpoints and curvature values (d) Arbitrary spline coefficients	1	K1	CO2
4. Solid modeling differs from surface modeling because it (a) Represents both the surface and volume of an object (b) Focuses only on external appearance (c) Uses only wireframe entities (d) Ignores geometric constraints	1	K2	CO2
5. The Z-buffer algorithm is mainly used for (a) Hidden surface removal (b) Image clipping (c) Coordinate transformation (d) Surface shading	1	K1	CO3
6. Gouraud shading differs from Flat shading because it (a) Interpolates vertex intensities across the surface for smooth effect (b) Uses constant color per face (c) Ignores light sources (d) Is faster but less realistic	1	K2	CO3
7. GKS provides a standard for (a) Device-independent 2D graphics programming (b) High-speed numerical computation (c) 3D modeling only (d) Machine control interfaces	1	K1	CO4
8. Communication standards in CAD/CAM systems are essential for (a) Reliable transfer of data between design and manufacturing equipment (b) Restricting system interoperability (c) Limiting real-time data exchange (d) Hiding data from users	1	K2	CO4
9. Assembly modeling helps in understanding (a) Product structure, motion, and interference between parts (b) Manufacturing cost analysis only (c) Tool path generation (d) Texture mapping	1	K2	CO5
10. The function of a CNC controller is to (a) Interpret part programs and control machine movement (b) Perform only temperature regulation (c) Control power supply voltage (d) Store cutting tools	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

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| 11. Define design process and list its key phases. | 2 | K2 | CO1 |
| 12. Explain how CAD is linked to CAM in manufacturing. | 2 | K2 | CO1 |
| 13. Define a B-Spline curve and state its main advantage. | 2 | K2 | CO2 |
| 14. What is a Boolean operation in CSG? | 2 | K1 | CO2 |
| 15. What is the purpose of hidden line removal in computer graphics? | 2 | K2 | CO3 |
| 16. Mention any two differences in RGB and HSV color models. | 2 | K3 | CO3 |
| 17. What is Open Graphics Library (OpenGL)? | 2 | K1 | CO4 |
| 18. What is the role of CALS in digital documentation and manufacturing? | 2 | K2 | CO4 |
| 19. What is an exploded view in an assembly model? | 2 | K1 | CO5 |
| 20. Explain how materials and textures contribute to a realistic model. | 2 | K2 | CO5 |
| 21. Write short notes on spindle drives in CNC machines. | 2 | K2 | CO6 |
| 22. List out the steps to set work zero and tool offset in CNC machining. | 2 | K2 | CO6 |

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

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| 23. a) (i) Compare sequential and concurrent engineering based on workflow. | 6 | K3 | CO1 |
| (ii) How does the CAD system architecture support 3D modeling? | 5 | K2 | CO1 |

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| b) A point P (1, 2, 3) is first rotated by 90° about Z-axis and then translated by (2, -1, 3). Compute the final coordinates using matrix multiplication of the combined transformation. | 11 | K3 | CO1 |
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| 24. a) Differentiate between quadratic and cubic Bézier curves with respect to their control points, flexibility, and shape control. Illustrate your answer with appropriate sketches. | 11 | K3 | CO2 |
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| b) Explain in detail about Hermite cubic curve. | 11 | K3 | CO2 |
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| 25. a) Demonstrate Boundary representation (B rep) technique of solid modeling with Example. | 11 | K2 | CO3 |
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| b) Discuss in detail about Constructive Solid Geometry with example showing tree diagram. | 11 | K2 | CO3 |
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| 26. a) Explain the Graphical Kernel System (GKS) standard. Describe its structure, functions, and features used for 2D computer graphics. | 11 | K2 | CO4 |
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| b) Describe the different sections of an IGES file with their purpose and contents. Illustrate with an example data flow between two CAD systems. | 11 | K2 | CO4 |
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| 27. a) Demonstrate the steps to be followed in bottom-up assembly approach for a piston-cylinder system using CAD software. Explain how individual parts are integrated into the main assembly. | 11 | K3 | CO5 |
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| b) Explain RGB and CMY Colour model in detail with illustrations. | 11 | K3 | CO5 |
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28. a) Explain how the mechanical structure, drive system, and control system of a CNC machine collectively ensure precise tool positioning during complex machining operations with the support of neat sketches. 11 K3 CO6

OR

- b) Develop a short part program using subprograms and loops for drilling multiple holes on a rectangular plate using G and M codes. Explain how repetition is achieved. 11 K3 CO6