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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech.

SEM: V - THEORY EXAMINATION (2022 - 2023)

Subject: Computer Aided Engineering

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION A

20

1. Attempt all parts:-

- | | | |
|------|---|---|
| 1-a. | GUI stands for (CO1) | 1 |
| | (a) Graphics uniform interaction | |
| | (b) Graphical user interaction | |
| | (c) Graphical user interface | |
| | (d) None of the above | |
| 1-b. | Which of the following uses the Beam penetration method? (CO1) | 1 |
| | (a) Raster scan system | |
| | (b) Random scan system | |
| | (c) Both Raster and Random scan system | |
| | (d) None of the above | |
| 1-c. | An accurate and efficient raster line-generating algorithm is (CO2) | 1 |
| | (a) DDA algorithm | |
| | (b) Mid-point algorithm | |
| | (c) Parallel line algorithm | |

- (d) Bresenham's line algorithm
- 1-d. In Bresenham's circle algorithm, if the decision parameter d_k is positive then (CO2) 1
- (a) Closest pixel will be outside the true circle
 - (b) Closest pixel will be inside the true circle
 - (c) Closest pixel will be lies on the true circle
 - (d) None of these
- 1-e. Which of the following is not a synthetic entity? (CO3) 1
- (a) Hyperbola
 - (b) Bezier curve
 - (c) B-spline curve
 - (d) Cubic spline curve
- 1-f. The boundary condition of Hermite curves are _____ (CO3) 1
- (a) two end-points and the two tangent vectors
 - (b) two end-points only
 - (c) two tangent vectors only
 - (d) none of these
- 1-g. B-rep and C-rep are the methods of _____ (CO4) 1
- (a) wireframe modeling
 - (b) surface modeling
 - (c) solid modeling
 - (d) 2D modeling
- 1-h. From the following, which method is also called as the Building Block Approach? (CO4) 1
- (a) Cellular Decomposition
 - (b) Spatial Occupancy Enumeration
 - (c) Generalized Sweeps
 - (d) Constructive Solid Geometry
- 1-i. Which of the following is not an FEA package? (CO5) 1
- (a) ANSYS
 - (b) Nastran
 - (c) Abaqus
 - (d) AutoCAD

- 1-j. In Finite Element Method, a given domain is subdivided into subdomains called as _____. 1
(CO5)
- (a) Nodes
 - (b) Finite elements
 - (c) Variational form
 - (d) Points

2. Attempt all parts:-

- 2.a. Differentiate between Random and Raster scan displays. (CO1) 2
- 2.b. What is the need of graphics standards? List some of the graphics standards. (CO2) 2
- 2.c. Tabulate the advantages and disadvantages of B-splines over Bezier curves. (CO3) 2
- 2.d. What do you understand by Blobby objects? How do you model them mathematically? (CO4) 2
- 2.e. Distinguish between FEM and FDM. (CO5) 2

SECTION B 30

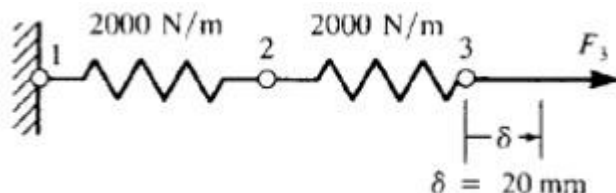
3. Answer any five of the following:-

- 3-a. What are the main components of Cathode Ray Tube? Explain its principle of operation with a line diagram. (CO1) 6
- 3-b. What do you understand by term windowing and clipping during the viewing transformations of images in computer graphics? Explain with suitable examples. (CO1) 6
- 3-c. Scale a triangular lamina and find the transformed coordinates with respect to the origin, having vertices A (10,20), B (10,10), and C (20,10) by $s_x=2$, $s_y=1.5$. (CO2) 6
- 3-d. What is the need of geometric transformations? What is its role in creating the three dimensional object models? Also write down the matrix for three dimensional translation transformations. (CO2) 6
- 3.e. Distinguish between the analytic curves and synthetic curves. Describe essential requirements for the synthetic curves in computer graphics. (CO3) 6
- 3.f. Discuss the importance of coloring of three-dimensional objects in computer graphics. Explain the following RGB and CMY color models. (CO4) 6
- 3.g. Explain the Galerkin's residual method and its use to derive the one-dimensional bar element equations. (CO5) 6

SECTION C 50

4. Answer any one of the following:-

- 4-a. What is CAE? Explain the application of CAE. Differentiate between the Classical design and Computer Aided Design. (CO1) 10
- 4-b. Explain the working principle of the following graphics devices with neat line sketches: (i) Light Pen (ii) Digitizer (CO1) 10
5. Answer any one of the following:-
- 5-a. Find the transformed coordinates of a triangle having vertices A (4, 1), B (7, 1) and C (7, 3) subjected to reflection through the line $2y = x$. (CO2) 10
- 5-b. Using midpoint Bresenham's circle generating algorithm, determine pixel positions along circle octant in the first quadrant from line $x = 0$ to line $x = y$. The radius of circle is 10 units. Plot the generated pixel positions. (CO2) 10
6. Answer any one of the following:-
- 6-a. A Bezier curve is defined in two-dimensional plane by the four control points $P_0(1, 1)$, $P_1(2, 3)$, $P_2(4, 3)$ and $P_3(3, 1)$. Determine seven points on Bezier curve and plot them. (CO3) 10
- 6-b. How do you control the shapes of Hermite curves? Obtain the parametric equation for Hermite cubic spline curve. What are the limitations of Hermite curves? (CO3) 10
7. Answer any one of the following:-
- 7-a. How do you create a solid model by the Boolean operations in Constructive Solid Geometry? Explain CSG schemes of solid modeling with suitable examples. (CO4) 10
- 7-b. What do you understand by the sweep representation scheme of solid modeling? Discuss different types of sweep operations with suitable examples. (CO4) 10
8. Answer any one of the following:-
- 8-a. For the spring assemblages shown in following below figures, determine the nodal displacements, the forces in each element, and the reactions. Use the direct stiffness method for this problem. (CO5) 10



- 8-b. A stepped metallic bar is subjected to an axial force $P = 150 \text{ kN}$ as shown in figure. Determine the nodal displacements, elements stress in each material, and the reaction forces. (CO5) 10

