

IV B.Tech. II Semester Supplementary Examinations, July -2005

COMPUTER GRAPHICS

(Common to Mechanical Engineering and Production Engineering)

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Explain the features of Bresenham's line drawing algorithm.
(b) Mention the applications of computer graphics.
2. (a) Using the syntax of display file structure, write the algorithm to put an instruction into the display file.
(b) Explain the role of display file in the graphical image generation.
3. (a) Compute the transformation matrix of a triangle A (1,0), B (0,1) and C (1,1) after rotating about vertex B, 45 degrees anti-clockwise direction.
(b) Show that reflection about the line 'y = x' is attained by reversing the co-ordinates.
4. (a) What is the utility of segments? Explain the use of segment table for organizing information about the segments.
(b) What are the various data structures that are used for storing segments? Comment on their relative merits and demerits.
5. Explain the working of the Sutherland - Hodgeman algorithm for polygonal clipping with the help of suitable example.
6. Explain briefly the transformation steps for obtaining a composite matrix for rotation about an arbitrary axis with the rotation axis projected on to the z-axis
7. (a) Explain the basic concepts of hidden surfaces and line removal methods with suitable examples.
(b) Write about z-buffers.
8. Explain the process of generating curves and surfaces using
 - (a) Hermite method
 - (b) B-spline method.

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1. Write short notes on:
 - (a) Liquid crystal displays
 - (b) Raster scan display system
2. (a) Explain and demonstrate with suitable examples“ the even-odd method”of determining the polygon interior points.
(b) Explain the flood-fill algorithm for filling polygons.
3. (a) Prove that the scaling transformations commute; that is, $S_1 S_2 = S_2 S_1$.
(b) Prove that the 2-D rotations about the origin commute; that is, $R_1 R_2 = R_2 R_1$.
4. (a) Write procedure copy-segment (old-segment, new-segment) which copies old segment to new segment.
(b) Distinguish between window and view port.
5. Explain the following:
 - (a) Generalised clipping
 - (b) Multiple windowing.
6. Prove that any two successive 3-D rotations about a given rotation axis is commutative.
7. Write an 3D clipping algorithms for Parallel and Perspective projections.
8. Explain the process of generating curves and surfaces using
 - (a) Hermite method
 - (b) B-spline method.

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1. (a) Explain the concepts of aliasing and antialiasing. How can the effects of aliasing be minimized?
(b) Write short notes on frame buffer.
2. Explain the scan-line algorithm for polygon filling.
3. Give 3x3 homogeneous-coordinate transformation matrix which will have the same effect as each of the following transformation techniques:
 - (a) Translate down 1 unit and right 1 unit , and then rotate counter-clockwise by 45 degrees.
 - (b) Scale the y coordinate to make the image twice as tall, shift it down 1 unit rotate clockwise by 30 degrees.
4. (a) What is the utility of segments? Explain the use of segment table for organizing information about the segments.
(b) What are the various data structures that are used for storing segments? Comment on their relative merits and demerits.
5. Explain the following:
 - (a) Generalised clipping
 - (b) Multiple windowing.
6. (a) Write about 3D viewing transformations.
(b) Write the 3D homogeneous transformation matrix for each of the following transformation
 - i. shift 0.5 in X , 2.0 in Y and -0.2 in Z
 - ii. Rotate by $\pi/4$ about X axis
7. Outline the z-buffer algorithm. List the advantages and disadvantages of the z-buffer algorithm.
8. (a) Describe the properties of B spline approximations.
(b) What is the difference between Bezier curve and B-spline curve?

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1. Explain the steps involved in Bresenham algorithm for line drawing. Demonstrate with an example. Discuss its merits and demerits.
2. Explain the following:
 - (a) world, screen and normalised coordinates.
 - (b) 2D graphics primitives.
3. Give 3x3 homogeneous-coordinate transformation matrix which will have the same effect as each of the following transformation techniques:
 - (a) Translate down 1 unit and right 1 unit , and then rotate counter-clockwise by 45 degrees.
 - (b) Scale the y coordinate to make the image twice as tall, shift it down 1 unit rotate clockwise by 30 degrees.
4. Find the normalization transformation that maps a window whose lower left corner is at (1,1) and upper right corner is at (3,5) onto (a) a view port that is the entire normalized device screen and (b) a view port that has the lower left corner at (0,0) and upper right corner at (1/2,1/2).
5. Explain the following:
 - (a) Generalised clipping
 - (b) Multiple windowing.
6. (a) Explain the perspective projection for projecting 3D objects on a 2D view surface.
(b) Write a procedure for rotating a given object about any specified rotation axis.
7. Outline the z-buffer algorithm. List the advantages and disadvantages of the z-buffer algorithm.
8. (a) Describe the properties of B spline approximations.
(b) What is the difference between Bezier curve and B-spline curve?
