

Code No: R31054

R10

Set No: 1

III B.Tech. I Semester Regular Examinations, November/December - 2012

COMPUTER GRAPHICS

(Common to Computer Science and Engineering & Information Technology)

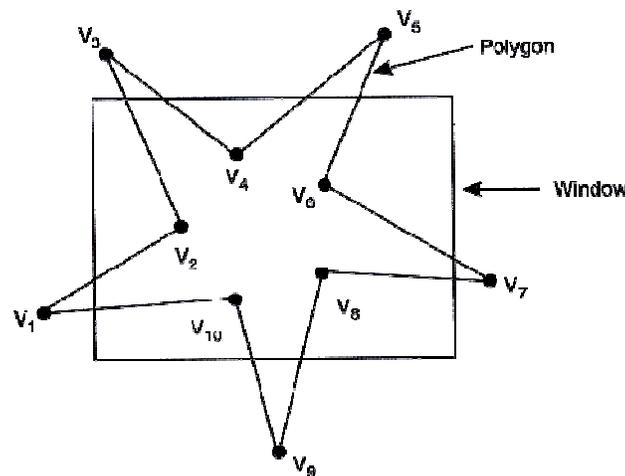
Time: 3 Hours

Max Marks: 75

Answer any FIVE Questions

All Questions carry equal marks

1. (a) How long would it take to load a 640 by 480 frame buffer with 12 bits per pixel, if 10^5 bits can be transferred per second? How long would it take to load a 24-bit per pixel frame buffer with a resolution of 1280 by 1024 using this same transfer rate?
(b) Consider a line from (0, 0) to (-8, -4) in the third quadrant. Evaluate the points on the line using Bresenham's algorithm?
2. Consider a polygon with following vertices. (10, 8) (5, 15) (20, 40) (18, 5) (15, 10). Prepare the active edge list for scan-line filling algorithm. Also identify the vertices to be double counted.
3. A mirror is placed such that it passes through (2, 0) and (0, 2). Find the reflected view of a triangle with vertices (3, 4), (5, 5) and (4, 7) in this mirror.
4. Explain Sutherland-Hodgeman's algorithm taking an example given below showing all stages.



5. Use a quadratic B-spline curve with five control points to prove that B-spline blending function sum to unity.
6. Prove that the multiplication of three-dimensional transformation matrices for each of the following sequence of operations is commutative.
 - (a) Any two successive translations
 - (b) Any two successive scaling operations
 - (c) Any two successive rotations about any one of the coordinate axes.

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7. (a) Write z-buffer algorithm for back-face detection. What are its advantages?
(b) Write short notes on Area Subdivision algorithm.

8. Write short notes on the
 - (a) Design of animation sequences
 - (b) Motion specifications
 - (c) Raster animation

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Max Marks: 75

Answer any FIVE Questions

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1. (a) Plot a circle centered at (5, 5) having a radius 5 units using midpoint circle algorithm and Cartesian graph.
(b) How does magnetic tablet locate coordinates of stylus? Why won't a light pen work with LCD?
2. Explain with algorithm, the active edge scan line scan conversion algorithm for polygons. Why are only non horizontal lines stored in the edge list of the scan line algorithm?
3. A line is denoted by its end point (0, 0) and (3, 5) in a 2D graphic system. Express the line in matrix notation and perform the following transformation on this line:
(i) Scale the line by a factor of 3.0 in x direction and 2.0 in y direction, with respect to (3, 4).
(ii) Translate the original line by 2 units in x direction and 3 units in negative y direction.
(iii) Rotate the line by 60° about the origin.
(iv) Plot the original line and the lines after each of the above transformation.
4. Given a clipping window **P** (0, 0), **Q** (340, 0), **R** (340, 340) and **S** (0, 340), find the visible portion of the line **AB** [(-170, 595), (170, 225)] and **CD** [(425, 85), (595, 595)] against the given window, using Cohen - Sutherland algorithm, showing all the steps.
5. (a) Explain Bezier and B-spline surfaces with necessary equations?
(b) Determine the blending functions for uniform periodic B-spline curves of degree four. Assume at least 5 control points are specified.
6. For a standard perspective projection with vanishing point at (0, 0, -d) what is the projected image of a line segment joining P(-1, 1, -2d) and Q(4.5, 6, 3).
7. (a) Explain different hidden surface removal algorithms with examples.
(b) Explain scan-line algorithm for hidden surface removal.
8. (a) What are steps in design of animation sequence. Describe about each step briefly?
(b) Describe linear list notation of animation language?

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Max Marks: 75

Answer any FIVE Questions

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1. (a) Suppose we have a computer with 32 bits per word and a transfer rate of 1 million instructions per second. How long would it take to fill the frame buffer of a 300 dots per inch laser printer with a page size of 8.5 inches by 11 inches?
(b) Digitize a line from (10, 12) to (20, 18) on a raster screen using Bresenham's straight line algorithm. Show the result on a Cartesian graph?
2. During area filling one starts with a point inside the program region and paint it outward towards boundary. Which fill algorithm is this? Explain it showing how 8-connected approach fills complex figures?
3. Use triangle PQR [(2, 3), (5, 8), (7, 2)] to show that two successive reflections about either of the coordinate axes is equivalent to a single rotation about the origin.
4. (a) Explain the Cyrus- Beck algorithm for generalized line clipping.
(b) Explain the mid-point subdivision method of clipping a line segment.
5. (a) Derive the parametric expression for the Bezier surface and explain the properties of Bezier surface. Assume any convenient degree for the surface.
(b) Derive blending functions for a B-Spline curve of degree 4. Assume atleast five control points are given.
6. Determine a 3 D transformation matrices to scale the line PQ in the x direction by 3 by keeping point P fixed. Then rotate the line by 45° anti clockwise about the z axes. Given P (1, 1.5, 2) and Q (4.5, 6, 3).
7. Write the steps of the Z-buffer algorithm. Mention coherence properties useful to improve the efficiency of this algorithm?
8. (a) What are the various techniques to achieve the simple animation effects?
(b) What are the key frame systems? Explain.

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1. (a) Explain the architecture of a raster scan and random scan systems.
(b) Find the amount of memory required by a 8 plane frame buffer each of red, green and blue, having 1024x768 resolutions.
2. (a) Develop a flood fill algorithm to fill the interior of any specified area.
(b) What are the advantages and disadvantages of 4-connected and 8-connected pixels in the case of the flood-fill algorithm?
3. Prove that the reflection of a square **ABCD** [(2, 2), (4, 2), (4, 4), (2, 4)] about x axis ($y = 0$) and then rotation of the resulting square about 60° will not be same if the order of transformation (first rotation and then reflection) is changed.
4. Find the normalization transformation that maps a window whose corners are (2, 2), (10, 6), (8, 10) and (0, 6) onto a viewport which is the entire normalized device screen with lower left corner at (2,2).
5. Derive the B-spline basis functions for third degree curve assuming a control polygon of five vertices?
6. Explain 3-D rotation and derive the expression for 3-D rotational transformation matrix.
7. (a) Differentiate between the object space and image space method for detecting visible surfaces.
(b) Write the algorithm for depth sorting method and explain the working with an example.
8. Write short notes on the following
 - (a) Raster animation
 - (b) General computer animation languages
 - (c) Key frame systems
