HARITA 901129 Paper I

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 856 **E** **Your Roll No.....**

Unique Paper Code : 234601

Name of the Course : **B.Sc. (H) Computer Science**

Name of the Paper : Computer Graphics (CSHT–614)

Semester : VI

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. The question paper consists of **two** sections.
3. **Section A** is compulsory.
4. Attempt any **four** questions from **Section B.**

SECTION A

1. (a) Consider two different raster systems with resolutions 640×480 and 1280×1024. What size frame buffer (in bytes) is needed for each of these systems to store 12 bits per pixel ? (2)

640×480×12 B
1280×1024×12 B

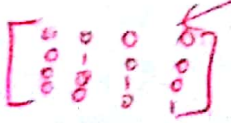
(b) What is anti-aliasing ? Discuss any one anti-aliasing method. (3)

2. (a) What is the condition that ellipse scan conversion algorithm uses to divide the first quadrant of the ellipse in two regions ? (3)

(b) What are the disadvantages of DDA line drawing algorithm ? (2)

3. (a) Write the 3D projection matrices for each of the following :

(i) Orthographic projection on x=0 plane



(ii) Single point perspective projection with centre of projection on y-axis at $y_c = 2$.

(iii) Trimetric Projection matrix. (1+2+2)

4. Derive the basis matrix for Bezier curve. (5)

5. Discuss Depth sorting method for hidden surface elimination. What tests are performed when there is depth overlap ? (5)

6. (a) Write steps to design an animation sequence. (2)

(b) What is Dithering ? What is its advantage over halftoning ? (3)

7. Derive the illumination using Phong specular-reflection model. Include the contribution of diffuse, ambient and specular reflection. (5)

SECTION B

8. (a) Explain Shadow mask and beam penetration methods used in raster scan systems to display colors. (4)

(b) Indicate which raster locations would be chosen by Bresenham's algorithm when scan-converting a line from screen coordinate (1,1) to screen co-ordinate (8,5). (6)

9. (a) Differentiate between Phong and Gouraud shading models. (4)

(b) Consider a polygon ABCDE, A(2,3), B(7,3), C(7,17), D(4,7), E(2,10). Use Scan line fill algorithm to fill the polygon till scan line 8. Show the global edge table and active edge table at each step. (6)

10. (a) Show that a 2D reflection through the x-axis, followed by a 2D reflection through the line y=x, is equivalent to a pure rotation about the origin. (4)

(b) A clipping window has two vertices lying at (0,0) and (80,40). Use the line end point codes to determine whether the lines P(40,20), Q(70,50) and R(100,20), S(120,60) would be visible, partially visible or totally invisible. (4)

(c) What is RGB color model ? How RGB model represented ? (2)

11. (a) Give the 3D homogeneous matrix for each of the transformations in parts i-iii. :

(i) Scale in the x-dimension by 2 and the y-dimension by 3 with fixed point (4,2,2) (3+2+2)

(ii) Rotate by 30 degrees about the x-axis.

(iii) Reflect about the Y-axis.

(b) Consider a line AB parallel to Z-axis with end-points A[3 2 4 1] and B[3 2 8 1]. Perform perspective projection onto z=0 plane with the centre of projection at $Z_c = 2.0$. (3)

12. (a) Find the equation of the Bezier curve that passes through (0, 0) and (4, 2) and controlled through (14,10) and (4, 0). (5)

(b) Write the pseudo code for Z-buffer Visible surface determination algorithm ? What are its advantages and disadvantages ? (5)

13. (a) What are trace points ? How are they different from principal vanishing points ? (2)

(b) How do we simulate acceleration in any animation ? Describe how the frame spacing controls the motion simulated in an animation scene ? (4)

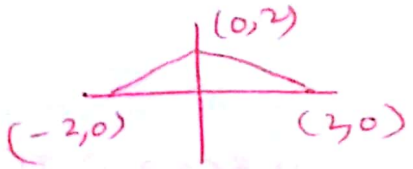
(c) A triangle is defined by vertices (2,0),(0,2),(−2,0). It is transformed by the 2×2 transformation matrix :

$$T = \begin{bmatrix} 6 & 4 \\ 2 & 4 \end{bmatrix}$$

Find the area of transformed triangle. (4)

New area det (T) * Area of org Δ

Area of org Δ = ½ b h



b = 4 , h = 2

area = ½ × 4 × 2 ⇒ 4

Area of T'Δ ⇒ det (A) * Area

⇒ (24 − 8) * 4 ⇒ 16 × 4 ⇒ 64

Paper II

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 6091 D Your Roll No.....

Unique Paper Code : 234601

Name of the Course : B.Sc. (H) Computer Science

Name of the Paper : Computer Graphics (CSHT–614)

Semester : VI

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question No. 1 is compulsory.
3. Do any **four** questions from the rest of the questions.
4. Parts of a question must be answered together.

1. (a) Show that the 2×2 matrix $[T] = \begin{pmatrix} \frac{1-t^2}{1+t^2} & \frac{2t}{1+t^2} \\ \frac{1-t^2}{1+t^2} & \frac{-2t}{1+t^2} \end{pmatrix}$ represents a pure rotation. (3)

(b) What is oblique projection ? Derive the standard matrix representation for oblique projection onto Z = 0 plane. (4)

(c) What are the major adverse side effects of scan conversion ? What methods are adopted to remove those effects ? (3)

(d) Describe Phong interpolation shading method. What are the merits and demerits of this method ? (3)

(e) Discuss the architecture of the raster display system with integrated display processor. (3)

P.T.O.

(f) Using the midpoint circle drawing algorithm, scan convert the first quadrant of a circle with center at (0, 0) and radius of 5 units. (4)

(g) What is the odd parity rule for filling a polygon ? (3)

(h) Write short notes on the following :

(i) Affine transformation.

(ii) Multi view orthographic projection.

(iii) Video mixing function of a video controller. (1×3=3)

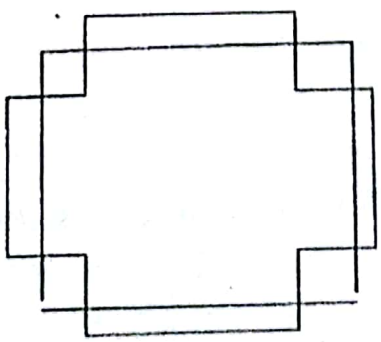
(i) How are the partial visible lines determined in Cohen Sutherland algorithm ? Give suitable figure. (3)

(j) What type of animation does a straight line function $y = mx + c$ produce and why ? (2)

(k) Compute the cavalier and cabinet projections with angles of 45° and 30° respectively of a pyramid with a square base of side 4 units positioned at the origin in the XY-Plane with a height of 10 units along the Z-axis. (4)

2. (a) Reflect the diamond-shaped polygon whose vertices are A(–1, 0), B(0, –2), C(1, 0) and D(0, 2) about the line $x = 2$. (4)

(b) Clip the polygon in the following figure against the rectangular window using the Sutherland Hodgman algorithm : (6)



3. (a) List any five properties of Bezier curve. (5)

(b) Consider a parallel projection with the plane of projection having the normal $(1, 0, -1)$ and passing through the origin $O(0, 0, 0)$ and having a direction of projection $d = (-1, 0, 0)$. Is it orthographic projection ? Explain your answer with reason. (5)

4. (a) Is there any method to increase the refresh rate in a raster display ? If yes, then explain it with a suitable diagram. (3)

(b) Discuss monitor non-linearity problem. (3)

(c) "Simultaneous shearing is not the same as shearing in one direction followed by shearing in another direction." Justify this statement mathematically. (4)

5. (a) How can you compute the depth values Z for a surface position (x, y) in z-buffer algorithm. Use suitable figure wherever necessary. (3)

(b) What is an image's aspect ratio ? If an image has a height of 2 inches and an aspect ratio of-1.5. What is its width ? (2)

(c) Develop the integer version of Bresenham's like drawing algorithm for lines in third quadrant. Bresenham's line drawing algorithm uses integer arithmetic. What is the justification of this approach ? (5)

6. (a) What are the different methods of representing polygon meshes ? Give advantages and disadvantages of each. (5)

(b) What is a composite transformation ? Give suitable example. (5)

7. (a) Discuss the principle of Half ton approximation. (3)

(b) How can we simulate negative acceleration in animation ? Explain. (3)

(c) What is a vanishing point ? How is it computed ? (4)

This question paper contains 3 printed pages.

Your Roll No. .....

F-5

Paper III

Sl. No. of Ques. Paper	: 6193
Unique Paper Code	: 2341503
Name of Paper	: Computer Graphics
Name of Course	: B.Tech. Computer Science
Semester	: V
Duration :	: 3 hours
Maximum Marks	: 75

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(Write your Roll No. on the top immediately on receipt of this question paper.)

The question paper consists of two Sections. Section A is compulsory. Attempt any four questions from Section B.

SECTION A

1. (a) Consider a raster system with a resolution of 250×250. For a 10×11 screen, find the radius of each pixel. 3

   (b) What is interlacing? 2

2. (a) Differentiate between DDA and Bresenham Line Drawing algorithm. 3

   (b) Discuss any *two* methods to draw a thick primitive. 2

3. (a) Give the structure of Global Edge table used in Polygon filling algorithm. 2

   (b) Prove that two successive scaling operations are commutative. 3

4. (a) Show that the following 2d matrix represents a pure rotation: 3

$$\begin{bmatrix} \frac{1-t^2}{1+t^2} & \frac{2t^2}{1+t^2} \\ \frac{-2t}{1+t^2} & \frac{1-t^2}{1+t^2} \end{bmatrix}$$

   (b) What is the value of Center of Projection w.r.t. parallel and perspective projection? 2

5. (a) Give the 3D rotation matrices for rotation by α, β and γ about X-axis, Y-axis and Z-axis respectively. 3

   (b) Why is depth sort algorithm also known as Painter's algorithm? 2

P. T. O.

6. (a) What are the properties of Bezier curve?

(b) What do you mean by ambient reflection and diffuse reflection? 2 12.

3

7. (a) What is the difference between Y in CMY and Y in YIQ color models respectively?

2

(b) How does the frame spacing control the motion simulated in an animation scene?

3

SECTION B

8. (a) Indicate raster positions that would be chosen while scan converting region 1 of an ellipse with major axis as 8 and minor axis as 5. The ellipse is centered at origin.

6

(b) Briefly explain the working of Liquid Crystal Display. 4

9. (a) Use the Cohen Sutherland algorithm to clip line P1 (70, 20) and P2 (100, 10) against a window lower left hand corner (50, 10) and upper right hand corner (80, 40).

6

(b) Consider the polygon with vertices A (2, 3), B (8, 3), C (8, 6), D (10, 6), E (10, 9) and F(5, 9). Write steps to fill this polygon using Odd-Parity rule. 4

scan fill

10. (a) The coordinates of square ABCD are A (0, 0), B (0, 4), C (4, 4), and D (4, 0). Scale it to half the size w.r.t. the fixed point that is the center of the square. 5

(b) What are rigid body transformations? Determine the conditions under which the generalized 2×2 transformation matrix represents a rigid body transformation.

5

11. (a) Write the 3D transformation matrices for the following:

(i) Uniform scaling by a factor of 2 w.r.t. the fixed point (1, 1, 2, 1). 3

(ii) Translation right by 2 units and up by 4 units. 2

(iii) Rotate about X-axis by 30° followed by rotation about z-axis by 45° 2

(iv) Two-point perspective projection on $z=0$ plane with Centre of Projection (COP) lying on X-axix as 2·0 and COP lying along y-axis as −1·0. 3

12. (a) Given a sequence of control points p0 (0, 0, 0), p1 (1, 2, 0), p3 (3, 1, 0). Write a formula for the Bezier curve formed from above three points. Use the formula to calculate the point $t = 1/3$ and the tanget at that point. 5

(b) Define morphing. Specify the rules to equalize the set of edges in key frames K and K + 1. 5

13. (a) Differentiate between halftoning and dithering. 4

(b) List the data structures used in Z-buffer algorithm for visible surface determination, along with the description of the values stored in them. 3

(c) Briefly explain the Gourand shading model. 3

This question paper contains 4+2 printed pages]

Paper IV

Your Roll No. .....

1957

B.Sc. (H) Computer Sci./VI Sem. C

Paper—603 : Computer Graphics

Time : 3 Hours *Maximum Marks : 75*

(Write your Roll No on the top immediately on receipt of this question paper.)

Section A is compulsory.

Attempt any *four* questions from Section B.

Section A

1. (a) Differentiate between raster scan and random scan systems. 4

(b) What is the condition that the ellipse scan conversion algorithm uses to divide the first quadrant of the ellipse into two regions. 3

2. (a) Briefly explain the z-buffer algorithm for visible surface detection. 4

(b) Discuss the characteristics of key-frame animation. 3

3. (a) Give the structure of global edge table and active edge table used in scan line fill algorithm. 4

(b) Show that parallel lines remain parallel after transformation. 3

4. (a) Derive the 3d homogeneous tranformation matrix to rotate an object about a line parallel to y-axis. 3

(b) Explain the intensity interpolation scheme for polygon rendering. What is its drawback ? 4

5. (a) Write the geometric vector used to define a : 4

(i) Hermite curve, and

(ii) Bezier curve.

(b) Define the following : 3

(i) Halftoning

(ii) Dithering

Section B

6. (a) How long would it take to load a 640 × 480 frame buffer with 12 bits per pixel. if 105 bits can be transferred per second. 3

(b) Calculate points on a line from (0, 0) to (4, −8) using Bresenhams line drawing algorithm. 7

7. (a) Briefly explain the working of a Liquid Crystal Display. 3

(b) What are the merits and demerits of storing and generating characters using bitmap method ? Give the structure of a bitmap font cache. 4

(c) Briefly explain any *one* basic method to draw thick primitives with its advantages and disadvantages. 3

8. (*a*) Let R be a rectangular window whose lower left corner is at L(3. 1) and upper right-hand corner is at R(2. 6). If the line segment is defined with two end points with A(–4, 2) and B(–1. 7) :

(*i*) The region codes of the two end points

(*ii*) Its clipping category and

(*iii*) Stages in the clipping operations using Cohen-Sutherland algorithm. 6

(*b*) Write steps to fill a polygon using scan line fill algorithm. 4

9. (*a*) Show that the composition of two rotations is additive that is : 3

$$R(\alpha) * R(\beta) = R(\alpha + \beta).$$

(*b*) Magnify the triangle with vertices A(0, 0), B(1, 1) and C(5, 2) to thrice its size while keeping B(1, 1) fixed.

(c) What are rigid body transformations ? Discuss the property of transformation matrix, which would give rigid body transformation. 3

10. (a) What are vanishing points ? How are they obtained in perspective projection ? 3

(b) Give 4 × 4 homogeneous-coordinate transformation matrix which will have the same effect as each of the following transformation :

(i) Rotate counter clockwise about x-axis and then translate up by 2 units. 2

(ii) Overall reduce the size of object to half. 2

(iii) Apply two point perspective projection on $z = 0$ plane with center projections on x-axis and y-axis given as (1, 0, 0) and (0, –2, 0). 3

11. (*a*) Derive the basic matrix for a Bezier curve ? Write any two properties of Bezier curve ? 5

(*b*) How do we simulate acceleration in key frame systems ? 3

(*c*) List any *four* logical input-device classifications used by the graphics systems. 2

This question paper contains 4 printed pages.]

Paper V

Your Roll No. .....

1805

A

B.Sc. (H) Computer Sci./VI Sem.
Paper—603 : Computer Graphics
(Admissions of 2001 and onwards)

Time : 3 *Hours* *Maximum Marks* : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt all questions.

1. (a) If a screen has 513 scan lines and an aspect ratio of 3:4, and if each pixel contains 8 bits worth of intensity information, how many bits per second are displayed if 30 frames are displayed per second ? 3

(b) Discuss the working of impact and non-impact printers with examples. 3

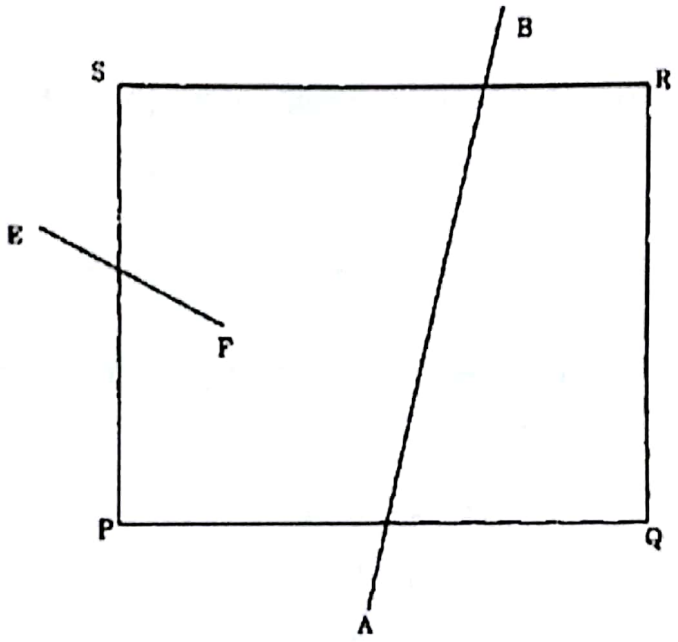
(c) Briefly explain the interlaced refresh procedure in a raster scan system and its advantage. 3

(d) What is aliasing? How can the effects of aliasing be

2. (a) Indicate which raster locations would be chosen by Bresenham's algorithm when scan-converting a line of thickness 3 from screen coordinate (1,1) to screen co-ordinate (8,5). 6

(b) Enumerate the steps for scan line polygon fill algorithm. Also, list the data structures used. 5

(c) Consider the following Clip Rectangle PQRS and lines AB and EF:



Assume P(5,5) and R(15,15), E(3,13), F(7,11), A(10,3) and B(12,18).

Answer the following questions:

(i) Compute the region codes for line AB using Cohen and Sutherland Line clipping algorithm. 2

(ii) Using Liang Barsky Line Clipping algorithm, Compute the value of the parameter (t) at which EF intersects the edge PS and classify it as entering point or leaving point with respect to the rectangle PQRS. 4

(d) Draw a flowchart for the logic of Sutherland-Hodgeman polygon

3. (a) Give the transformation matrix for each of the following transformations :

(i) Scale in the X-dimension by 2 and y-dimension by 3 with respect to fixed point (4,2). 2

(ii) Rotate by – 30° about the point (– 2,3). 2

(iii) Reflect about the line y = – 5. 3

(Use Homogenous coordinates sin (– 30)= ⁻ ½ and cos (– 30) = $\sqrt{3}/2$)

(b) Prove that parallel lines remain parallel after transformation. 3

(c) Consider a 3D object X with the position vectors given below :

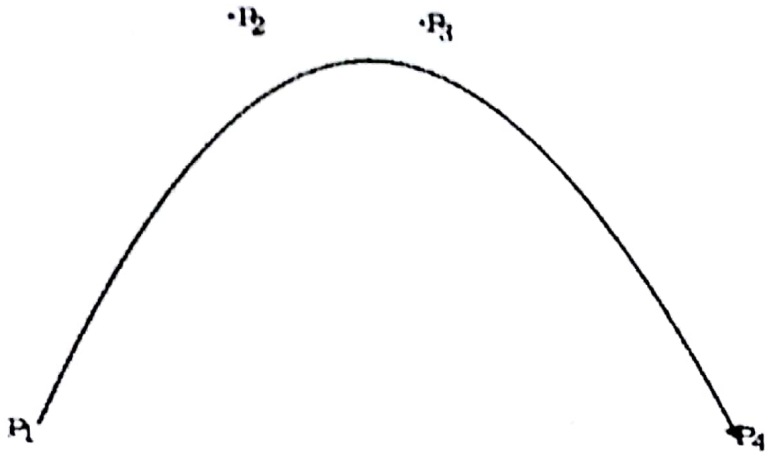
$$X = \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

(i) Obtain a covalier projection for X, choosing horizontal angle as 30°. 3

(ii) Obtain a single point perspective transformation for X with centre of projection $x_p = (-10, 0, 0)$ projected onto $y = 0$ plane. Also

4. (a) Obtain the blending function for hermite curve . 3

(b) Given the following Bezier curve defined by four control points P_1, P_2, P_3, and P_4 divide it into two curve segments in the ratio 1 : 1. 3



(c) Describe an algorithm that, gives a grayscale image,will produce a black and white (bi-level) image of four times the resolution in each dimension which provides a good approximation to a grayscale image. 4

5. (a) Explain the depth buffer method in image space to detect visible surfaces of an object. 4

(b) How do we simulate acceleration in any animation ? Describe how the frame spacing controls the motion simulated in an animation scene ? 4

(c) Explain the Gourad shading scheme for polygon rendering. What is its drawback? 4

12500
Paper VII

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1333 **F-7** **Your Roll No.....**

Unique Paper Code : 2341503

Name of the Paper : Computer Graphics

Name of the Course : **B.Tech. Computer Science**

Semester : V

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. The question paper consists of **two** sections.
3. **Section A** is compulsory.
4. Attempt any **four** questions from **Section B.**

1	3, 2
2	5
3	3, 2
4	3, 2
5	3, 2
6	3, 2
7	2, 3

8	4, 5
9	4, 6
10	4, 6
11	1, 2, 3, 4
12	5, 5
13	5, 5

4 out of 6. 2 empty

SECTION A

1. (a) Consider a raster system with the resolution of 640 × 480 How many pixels can be accessed per second in this system by a display controller that refreshes the screen at a rate of 60 frames per second ?

What is the access time per pixel in this system ? (3)

(b) Cite any two differences between Beam Penetration and Shadow mask CRT. (2)

2. Indicate raster positions that would be chosen in the first quadrant while scan converting a circle of radius 5 centered at origin. (5)

3. (a) Using Cohen Sutherland Line Clipping algorithm, clip the line segment PQ with P(0, 5) and Q(1, 5) by rectangular window defined as A(0, 0), B(1, 0), C(1, 1) and D(0, 1). (3)

P.T.O.

(b) Show that origin is invariant under a general 2 × 2 transformation matrix given below :

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$ (2)

4. (a) A unit square is transformed by 2 × 2 transformation matrix. The resulting position vector are

$$\begin{bmatrix} 0 & 2 & 8 & 6 \\ 0 & 3 & 4 & 1 \end{bmatrix}$$

What is the transformation matrix ? (3)

(b) What is the difference between Cabinet and Cavalier projections ? (2)

5. (a) Write a 3D transformation matrix that scales an object to double its size w.r.t a fixed point (1, 1, 2). Use homogenous coordinates. (3)

(b) Give one advantage and one disadvantage of the Z-buffer algorithm ? (2)

6. (a) Distinguish zero-order, first-order and second-order continuity for polynomial curves. (3)

(b) What is the advantage of Gourad shading over flat shading ? (2)

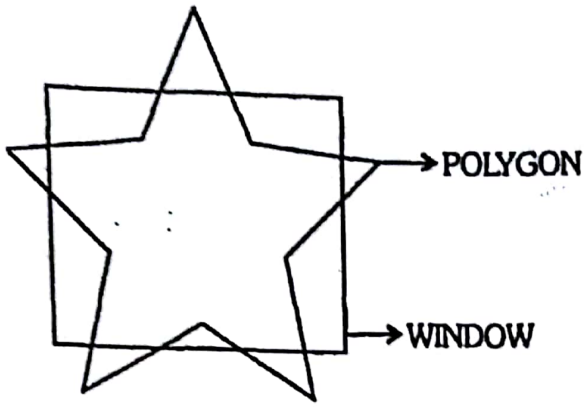
7. (a) What are additive and subtractive color models ? (2)

(b) How do we specify animation sequences using kinematic and Dynamic description ? (3)

SECTION B

8. (a) Write an algorithm to produce a line segment of 3 pixel width using DDA algorithm. (4)

(b) Use Sutherland Hodgeman polygon clipping algorithm to clip the polygon (star shaped) shown below. Label the vertices of the star appropriately. (6)



9. (a) Briefly explain the working of Plasma Panel display. (4)

(b) Consider the polygon with vertices A(2,3), B(7,1), C(11,4), D(11,11), E(7,7), F(2,9). Use scan fill algorithm to fill the polygon till scan line number 8. Show the entries in global edge table and active edge table for every scan line. (6)

10. (a) Find the composite tranformation matrix to reflect the triangle ABC with coordinates A(5,50), B(20,40) and C(10,70) w.r.t to a line passing through the points (10,10) and (0,10). (4)

(b) Derive Dimetric projection matrix where foreshortening of lines along x-axis is equal to foreshortening of lines along z-axis. (6)

11. Write the 3D transformation matrices for the following :

(i) Scale by a factor of 2 along x-axis and 3 along y axis. (1)

(ii) Shear along X-axis given shearing factors 2 and 4 units along Y and Z-axis respectively. (2)

(iii) Rotate about x-axis by 30° w.r.t fixed point (1,2,1,1). (3)

P.T.O.

(iv) Two-point perspective projection on X=0 plane with Centre of projection (COP) lying on Z-axis as 2.0 and OP lying along Y-axis as –1.0. Also give the respective vanishing points. (4)

12. (a) Given a cubic B′ezier curve x(t), which is defined by control points p0, p1, p2, p3. Derive the equation x(t) for the tangent of the curve at each value of t. Evaluate x′(0) and x′(1). (5)

(b) Describe the steps required to design an animation sequence. (5)

13. (a) Describe the Area-subdivision algorithm for visible surface determination. (5)

(b) How can we increase the number of intensity levels in a bi-level display ? Explain with the help of an example ? (5)

60
35
95
42.

[This question paper contains 4 printed pages.]

Your Roll No..............

Sr. No. of Question Paper : 795 G

Unique Paper Code : 234601

Name of the Paper : Computer Graphics

Name of the Course : B.Sc. (H) Computer Science

Semester : VI

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. The Question paper consists of two sections. Section A is compulsory. Attempt any four questions from Section B.

Section A

1. (a) What is the number of memory bits required for a 3-bit plane frame buffer for a 256 x 256 raster scan system? (2)

(b) Briefly explain the interlaced refresh procedure in a raster scan system and its advantage. (3)

$(x,y) \rightarrow [x, y, h]$

- → origin invariant
- → No need for in 2D translation constants

$x = \frac{x'}{h}$ $y = \frac{y'}{h}$.

2. (a) What are homogenous coordinates? Why are they used in computer graphics? (3)

(b) Prove that two scaling transformations are commutative i.e. $S_1 S_2 = S_2 S_1$ (2)

$$\begin{bmatrix} m & 0 & 0 \\ 0 & m & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} n & 0 & 0 \\ 0 & n & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

3. Write the DDA line drawing algorithm to draw lines with slope less than 1. (5)

$\Delta x = +1$

$y_{k+1} = y_k + m$) start point is left

4. Derive the rotational transformation matrix for a 2-D system, provided the rotation is performed about the origin. (5)

$$\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$$

5. (a) Prove that parallel line remain parallel after transformation. Show slope remains same before & after transformation (3)

$\left(\frac{x_1 - x_2}{x_1 - x_2}\right)$

(b) Write a homogenous 3D transformation matrix to double the size of an object and project it on Z=0 plane. (2)

$$\begin{bmatrix} 2 & 2 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 & 0 & 1 \end{bmatrix}$$

6. (a) What is the geometric vector of a hermite curve? (2)

$[P_0\ P_1\ R_0\ R_1]$ P_0, P_1 → control points, R_0, R_1 → tangent vectors

(b) Briefly explain Phong shading method for polygon rendering. (3)

① determine unit normal vector at each poly. vertex

② Interpolate vertex normal over poly. surface

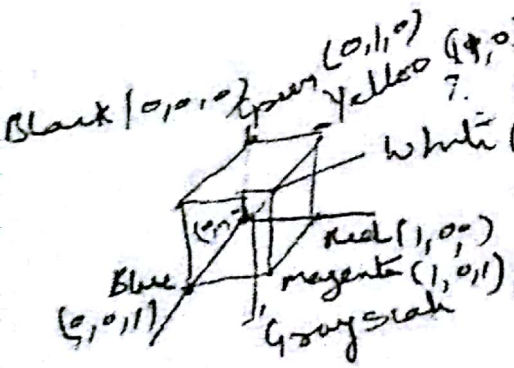
③ Apply illumination model at each scan line to calculate pixel intensity (2)

7. Define the following terms: (2)

(a) RGB color Model

(b) Halftoning

→ each intensity area is reproduced as a series of black circles on white background



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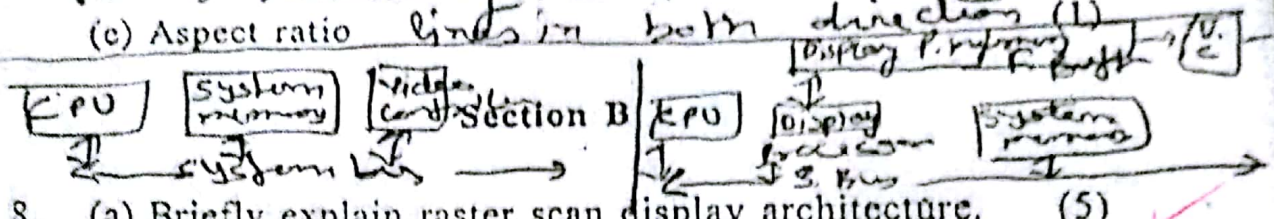
(c) Aspect ratio ratio of vertical points to horizontal points necessary to produce equal length lines in both direction (1)

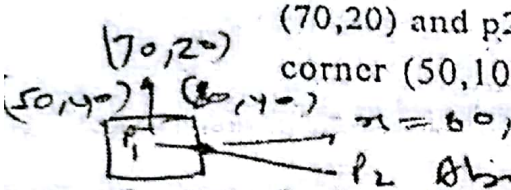


8. (a) Briefly explain raster scan display architecture. (5)

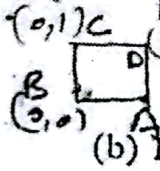
(b) Consider a circle with centre as (10,10) and radius as 20. Write an algorithm to the draw the circle between positive y-axis and the line y=x. (5)

9. (a) List the four techniques to draw thick primitives. Describe any two of them. (5)

(b) Use the Cohen Sutherland algorithm to clip line P1 (70,20) and p2(100, 10) against a window lower left hand corner (50,10) and upper right hand corner (80,40).



10. (a) Consider the square A(1,0), B(0,0), C(0,1), D(1,1). Rotate the square ABCD by 45° clockwise about A(1,0).



(b) Derive Dimetric projection matrix where foreshortening of lines along X-axis is equal to foreshortening of lines along Z-axis. (5)

(c) What are principal vanishing points? (2)

→ Points formed by intersection of lines parallel to one of the three principal axes.

P.T.O.

→ Points formed on the horizontal xy line at which lines originally parallel to the transformed principal axes converges.

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11. (a) What are the two data structures used in scan line fill algorithm? Give the structure of each. (4)

(b) Obtain a 2-point perspective projection of a line AB with endpoints A(3,2,4,1) and B(3,2,8,1), where the plane of projection is z=0 and centre of projections are at y=2 and z=-1. Also obtain the two vanishing points. (4)

(c) What are oblique projections? List the two types of oblique projections. (4)

12. (a) Derive the basis matrix for a Bezier curve. Write any two properties of Bezier curve. (4)

(b) In an Animation, a triangle has to be converted into a quadrilateral, write steps to adjust the object specification so that number of vertices is equalized in both the frames. (5)

13. (a) Distinguish between diffuse reflection and specular reflection in Phong illumination model. (4)

(b) Describe the Area subdivision algorithm for visible surface determination. (6)

(1200)

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[This question paper contains 4 pr

Sr. No. of Question Paper	: 795
Unique Paper Code	: 2346(
Name of the Paper	: Comp
Name of the Course	: B.Sc.
Semester	: VI
Duration : 3 Hours	

Instructions for Candidates

1. Write your Roll No. on the to this question paper.
2. The Question paper-consists of compulsory. Attempt any four

Section

1. (a) What is the number of mem plane frame buffer for a 25

(b) Briefly explain the interla raster scan system and its