

( 4 )

8. (a) Set up the equation of Bezier curve and roughly trace it for three control points (1, 1), (2, 2) and (3, 1). 6

(b) Write short notes on any two : 8

(i) Z-buffer algorithm

(ii) RGB and CMY color models

(iii) Phong's shading model

(iv) Virtual reality.

Total Pages —4

UL(7)—Comp. Graph.

B.Tech 7th Semester Examination 2015

COMP. GRAPH.

Full Marks : 70

Time : 3 hours

Answer any five questions

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

1. (a) What are the criteria that should be satisfied by a good line drawing algorithm ? Explain. 7

(b) Write mid-point circle algorithm and predict the pixels in any octant of circle for radius = 10 pixels with its center at origin. 7

2. (a) Write advantages of raster scan display over random scan display. 7



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- (b) Consider three different raster systems, with resolutions of  $640 \times 400$ ,  $1280 \times 1024$  and  $2560 \times 2048$ . What size frame buffer (in byte) is needed for each of these systems to store 12 bits per pixel? How much storage is required for each system if 24 bits per pixel are to be stored? 7
3. (a) Write an algorithm for filling polygons and explain it with a suitable example. 7
- (b) Compare Scan line fill and Boundary fill algorithms. 7
4. (a) What is composite transformation? Derive general pivot-point rotation and general fixed-point scaling matrices. Compute the computational efficiency of each. 7
- (b) What are homogeneous coordinates? If a line whose end points are  $(x_1, y_1)$  and  $(x_2, y_2)$  exists in 2D space, then write the concatenation of matrices that will rotate the mirror image of the line about mid-point 7

UL(7)–Comp. Graph.

( Continued )

( 3 )

- of the line by an angle  $60^\circ$  counter-clockwise. Each of the transformations has to be in homogenous coordinate system. 7
5. (a) Write any one line clipping algorithm. 7
- (b) Reflect the polygon  $(-1, 0), (0, -2), (1, 0)$  and  $(0, 2)$  about the line  $Y = 2$  by using transformation matrices. 7
6. (a) Explain the issues related to three dimensional display methods. Compare parallel projection and perspective projection methods for 3-D objects. 7
- (b) Derive a general form of 3D rotation about : 7
- (i) X-axis
- (ii) Z-axis.
7. (a) Write the properties of B-Spline curves. Also write advantages of B-Spline curves over Bezier curves. 7
- (b) What do you understand by the term "Back-Face Removal"? Explain a Back-Face removal algorithm. 7

UL(7)–Comp. Graph.

( Turn Over )



equidistant parameter values having central points :

$(x_0, y_0) = (50, 180), (x_1, y_1) = (250, 100),$

$(x_2, y_2) = (600, 300) (x_3, y_3) = 500, 50$

$8+6 = 14$

8. (a) Explain Z-Buffer algorithm:

(b) Describe briefly parallel and perspective projections.  $6+8 = 14$



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UL(7)— Comp.  
Graph.

2016

Time : 3 hours

Full Marks : 70

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer any five questions.

1. (a) What do you mean by Interactive Computer Graphics ? Define persistence in terms of CRT phosphorus. 7

(b) Discuss the applications of computer graphics. 7

2. (a) Differentiate raster and random scan displays. What are the advantages of Direct View Storage Tube (DVST) over CRT ? Also list some disadvantages of DVST. 7

(b) Explain Beam penetration method. 7

PT – 29/2

(Turn over)

PT – 29/2 (800)

(4)

UL(7)— Comp.  
Graph.



3. (a) Consider three different raster system with resolutions of  $640 \times 480$ ,  $1280 \times 1024$  and  $2560 \times 2048$  :

(i) What size is frame buffer (in bytes) for each of these systems to store 12 bits per pixel ?

(ii) How much storage (in bytes) is required for each system if 24 bits per pixel are to be stored ?

- (b) Consider two raster systems with the resolutions of  $640 \times 480$  and  $1280 \times 1024$  :

(i) How many pixels could be accessed per second in each of these systems by a display controller that refreshes the screen at a rate of 60 frames per second ?

(ii) What is the access time per pixel in each system ?  $7+7 = 14$

4. (a) Explain, in detail, about the DDA scan conversion algorithm.

PT - 29/2

(2)

Contd.

- (b) Plot a circle using mid point algorithm whose radius = 4 and centre is at (0, 0).  $8+6 = 14$

5. (a) Explain the following transformations with matrix representation in 2 - D plane :

(i) Reflection

(ii) Shearing

- (b) Perform a  $45^\circ$  rotation of triangle A(0,0), B(1, 1), C(5, 2) :

(i) About the origin

(ii) About P(-1, -1)

$7+7 = 14$

6. (a) Based on Cohen Sutherland line - clipping Algorithm :

Prove or disprove that 'A line is not visible if the bitwise logical AND of the region codes (representing the end-points of the line) is not 0000'.

- (b) Derive the matrix representation for 3 - D rotation about x - axis.  $7+7 = 14$

7. (a) Explain the advantages and disadvantages of B-spline surface over Bezier Surface.

- (b) Determine 1 points on a Bezier curve with

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(3)

(Turn over)



8. (a) Discuss the z-buffer algorithm for visible surface determination. Suggest an efficient alternative w. r. t. the storage requirement for the depth buffer. 7
- (b) With the help of a neat and clear diagram explain the RGB color model. Show the relationship between the RGB and the CMY color models. 7



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**2017(A)**

**Time : 3 hours**

**Full Marks : 70**

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Answer any five questions.*

1. (a) With the help of a neat and clear diagram explain the functioning of a CRT. 7
- (b) Distinguish between Random scan and Raster scan display devices. Give at least seven important differences. 7
2. (a) Explain the Bresenham's line drawing algorithm. According to you, among DDA and Bresenham's line drawing algorithm, which is more efficient and why? 7



(b) Using Mid Point circle drawing algorithm find the points required to rasterize or circle having a radius of 10 units and centered at the coordinate origin. 7

3. (a) If we wish to rasterize a  $1024 \times 768$  image, to that is 640 pixels wide retaining the original Aspect-Ratio, what would be the height of the resized image? 7

(b) What is the refresh rate of a  $1024 \times 1024$  frame buffer with an average access rate of 200 ns per pixel on a simple RGB color display. 7

4. (a) Explain the Boundary-fill algorithm with a suitable diagram. 7

(b) Explain the line clipping algorithm given by Cohen and Sutherland. Also discuss the Mid-Point subdivision method for finding the window boundary intersections with the crossing lines. 7

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(2)

Contd.

5. (a) What are the advantages of Homogeneous coordinates? Magnify a triangle with vertices  $A(0, 0)$ ,  $B(1, 1)$  and  $C(5, 2)$  to twice its size while keeping  $C(5, 2)$  fixed. 7

(b) Derive all the 3D rotation (w. r. t. different coordinate axes) transformation equations and their corresponding matrix representations. 7

6. (a) Obtain the rectangular window-to-viewport transformation equations. What inference do you draw from the derived equations? 7

(b) Define the term Parallel Projection. Derive the transformation equations and the matrix for Perspective Projection. 7

7. (a) Give the properties of Bezier-Bernstein Approximation. 7

(b) Explain what are Blending functions. Why do we prefer cubic splines for curve designing? Explain. 7

6.10.12 7

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(3)

(Turn over)



**UL (7)-Comp. Graph  
2018**

**Full Marks : 70**

**Time : 3 hours**

**Answer any five questions.**

*The figures in the right-hand margin indicate marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

1. (a) Distinguish between raster Graphics and random Graphics System. 7  
(b) Discuss the shadow-mask method for color CRT monitors. 7
2. (a) Discuss Bresenham line drawing algorithm and compare it with DDA line drawing algorithm. 7  
(b) Calculate the pixels on a Straight Line with End points (24, 12) and (32, 18) using Bresenham line drawing algorithm. 7
3. (a) Discuss mid-point circle drawing algorithm with suitable diagram and necessary derivations. 7

**(Turn Over)**

( 2 )

(b) Discuss mid-point Ellipse drawing algorithm with suitable diagram and necessary derivations. 7

4. (a) Discuss the scan line polygon filling algorithm with suitable diagram. 6

(b) Discuss different 2D transformation techniques with appropriate diagrams. 8

5. (a) Differentiate between Window and Viewport. Discuss the method of two-dimensional viewing-transformation. 7

(b) What is composite transformation ? Discuss the steps of rotating a point about any pivot point in terms of composite transformation. 7

6. (a) Discuss the Cohen-Sutherland line clipping algorithm with suitable diagram(s). 7

(b) What are the drawbacks of Cohen-Sutherland algorithm ? How these drawbacks can be removed using N-L-N line clipping algorithm ? Discuss with suitable diagrams. 7

7. Write short notes on (any two) : 7 x 2

(i) Bezier curve

UL (7)-Comp. Graph.

( Continued )

( 3 )

(ii) Z-buffer algorithm

(iii) B-spline curve.

UL (7)-Comp. Graph.

Hz-900



2019 (A)

Full Marks : 70

Time : 3 hours

Answer any five questions.

*The figures in the right-hand margin indicate marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

1. (a) Two endpoints of a line are given as (200, 120) and (225, 136). Calculate the successive pixel positions along the line path following the Bresenham's line drawing algorithm. 7

- (b) Given a circle radius  $r = 14$ , calculate the pixel positions along the circle octant in the first quadrant from  $x = 0$  to  $x = y$  using the mid-point circle algorithm. Assume the centre of the circle is at (0, 0). 7

2. Discuss with diagram the Bresenham's line drawing algorithm for  $|m| < 1$  along with all the necessary derivations. 14

(Turn Over)



( 2 )

3. (a) Analyze the merits and demerits of scan line polygon filling algorithm over flood-filling algorithm. 7

(b) Show the steps of deriving decision parameter  $P_{k+1}$  in terms of  $P_k$  in the midpoint circle drawing algorithm. 7

4. Discuss the midpoint ellipse drawing algorithm with all necessary derivations and suitable diagrams. 14

5. (a) Compute 2D transformation matrix for rotating a point (12, 6) about the point (3, 2) by an angle  $30^\circ$  in anti-clockwise direction. Also determine the new position of the point (12, 6). 6

(b) Discuss the Sutherland-Hodgeman Polygon Clipping algorithm with the help of diagrams and example. 8

6. Discuss different 3D transformation techniques along with the necessary derivation of transformation matrices and suitable diagrams. 14

( 3 )

7. (a) Derive the matrix for Perspective Projection with centre of projection at origin and Projection plane Z. 6

(b) Construct enough points on the Bezier curve whose control points are P0 (6, 3), P1 (9, 5) and P2 (12, 4) to draw an accurate sketch.

(i) What is the degree of the curve ?

(ii) What are the coordinates at  $u = 0.5$  ? 8

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UL (6)- Computer graphics

Time : 3 hours

2022(A) NEW

Full Marks : 70

Candidates are required to give their answers in their own words as far as practicable.

The figures in the right-hand margin indicate full marks.

Answer any **five** questions.

1. (a) What do you understand by CG? Discuss the components of computer graphics. [7]  
(b) Distinguish between Raster and Vector Graphics method. When do you prefer what? [7]

2. (a) Discuss the DDA Line drawing algorithm in details. Also implement the DDA algorithm to draw a line from (0,0) to (4,4). [7]

- (b) Write and explain Flood Fill Algorithm in details. [7]

3. (a) Write the Mid-Point Circle generating algorithm and also draw the derivation of decision parameter. [7]

- (b) Describe boundary fill algorithm for polygon with example. [7]

4. (a) Magnify the triangle with vertex A (0,0), B (1,1) and C (5,2) to twice its size while keeping C (5,2) fixed. What will be the new coordinate of the new triangle ABC. [7]

- (b) 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). [7]

5. (a) Determine the homogeneous transformation matrix for reflection about the line  $y=2x-6$ . [7]

- (b) Why are homogenous coordinates used for transformation computation in CG? [7]

6. (a) Describe Sutherland Hodgeman Polygon Clipping algorithm. What is its limitation? [7]

- (b) What is Window to View-Point coordinate transformation? Explain with suitable example. [7]

7. (a) Explain Painter's Algorithm in details. [7]

- (b) Explain Gouraud Shading algorithm. Discuss its advantages and disadvantages. [7]

8. Write short notes on the following:

(a) CRT [4]

(b) RGB & CMY [6]

(c) Ray Tracing [4]

..... The End.....