Srinivas Institute of Technology
Library, Mangalore

NEW SCHEME

IS664

USN

Sixth Semester B.E. Degree Examination, July/August 2005

Information Science and Engineering

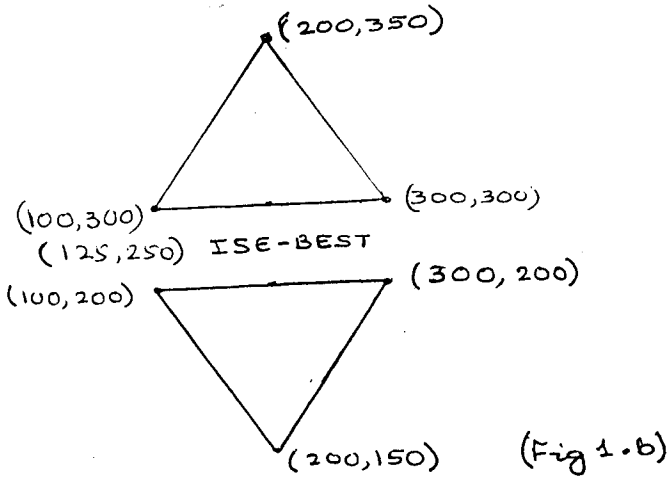
Computer Graphics

Time: 3 hrs.] [Max.Marks : 100

Note: *Answer any FIVE full questions.*

1. (a) How computer graphics applications are classified? Illustrate with examples. (4 Marks)

   (b) By writing a Pseudo code, explain how the object shown in figure 1.b is refreshed in a random scan display processor system. (8 Marks)



(Fig 1.b)

   (c) How image scanners are used in graphics environments? Explain with a figure the construction and working principle of an image scanner. (8 Marks)

2. (a) Explain the Bresenham's Mid point algorithm for scan converting straight lines. (10 Marks)

   (b) Explain the necessity of representing a straight line using parametric representation. Indicate the method of clipping a straight line, represented in parametric form, against a clipping window. (10 Marks)

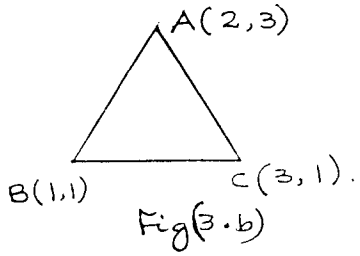
3. (a) Prove that successive rotation transformations are composable. (4 Marks)

   (b) Perform the following operations in sequence on the object shown in figure 3. b.

      i) scale the object to twice its size about the point (2, 2)

Contd.... 2

ii) Translate the resulting object with $T_x = -4$ and $T_y = 8$ (10 Marks)



Fig(3.b)

(c) Give the viewing transformation mapping function to map an object in a window whose extreme corners are at $((0,0),(1,0.5))$ on to a view port, whose extreme corners are at $((0,0.25),(1,0.75))$. (6 Marks)

4. (a) Prove mathematically the fact that the ortho-graphic parallel projection is a special case of oblique parallel projection. Briefly explain cabinet and cavalier projection technique. (10 Marks)

(b) Explain how a 3D object can be viewed by defining an arbitrary 3D projection coordinate system. (10 Marks)

5. (a) Rubber band techniques can be used to draw a poly line. Explain the statement by drawing the state diagram for rubber band creation of a polyline. (10 Marks)

(b) What is an icon? How can this be used for user interface design issues. Explain with examples the uses of icons. (10 Marks)

6. (a) What is a 'Blending Function '? Calculate the B-spline blending function for a uniform, integer knot vector by selecting the parameter values $d = 3; n = 3$. (10 Marks)

(b) How octrees can be used to represent solid objects? Illustrate with an example. (6 Marks)

(c) Bringout the application areas of Fractal geometry. (4 Marks)

7. (a) Explain the depth buffer image precision algorithm for determining the visible surface, with an example. (10 Marks)

(b) Explain any one technique in area sub division algorithm for visible surface determination. (10 Marks)

8. Write short notes on : (5×4 Marks)

a) Input devices for operator interaction

b) Character generators

c) BSP trees

d) Visible surface ray tracing

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NEW SCHEME

Srinivas Institute of Technology
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CS63

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VIVEKANANDA COLLEGE OF ENGG & TECH
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PUTTUR

Sixth Semester B.E. Degree Examination, July/August 2005

Computer Science / Information Science and Engineering

Computer Graphics

Time: 3 hrs.] [Max.Marks : 100

Note: *1. Answer any FIVE full questions.*
2. All questions carry equal marks.

1. (a) With a neat block diagram explain the conceptual frame work of interactive computer graphics. List its merits and demerits. (10 Marks)

   (b) With a neat sketch explain the architecture of raster scan display. Mention any two advantages and disadvantages. (10 Marks)

2. (a) Explain with an example the midpoint line scan conversion algorithm. Derive the equations for decision variables. (14 Marks)

   (b) What is antialiasing? Explain its functionality. (6 Marks)

3. (a) What is clipping? Explain the Cohen-Sutherland line clipping algorithm. (10 Marks)

   (b) Give the working principle of any one hard copy devices using (i) input in vector form ii) input in raster form. (10 Marks)

4. (a) A triangle in two dimensional system is defined by its vertices (4, 4), (6,4) and (8, 6). Determine the compound transformation matrix for the following sequence of transformations.

   The triangle is scaled by a factor of 2 about the point (4, 4). The triangle is further rotated by 90^0 about the same point (4, 4).

   Determine the transformed triangle. Sketch the original and transformed triangle. (10 Marks)

   (b) Explain the steps involved in world coordinate window to viewport transformation. Also get the transformation matrix. (10 Marks)

5. (a) With neat sketches explain the different types of planar parallel projections. (12 Marks)

   (b) With examples specify the viewing parameters for (i) Perspective projection (ii) Side view (8 Marks)

Contd.... 2

6. (a) Explain the important design considerations for the user interface. (10 Marks)

   (b) Briefly discuss the interaction hardware. (10 Marks)

7. (a) Explain the B-spline technique of generating curves and illustrate with examples. (10 Marks)

   (b) With illustrations explain Bazier curves. (10 Marks)

8. (a) What is meant by coherence? Discuss different kinds of coherence. (10 Marks)

   (b) Explain scan line algorithm for visible surface determination. With an example obtain the contents of ET, PT and AET. (10 Marks)

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Srinivas Institute of Technology
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CS63

NEW SCHEME

Reg. No.

SRINIVAS COLLEGE OF ENGG. & TECHNOLOGY
LIBRARY
MUKKA, PUTTUR

Sixth Semester B.E. Degree Examination, January/February 2006

Computer Science & Engineering

Computer Graphics

Time: 3 hrs.) (Max.Marks : 100

Note: *Answer any FIVE full questions.*

1. (a) What are the advantages of interactive graphics? Explain in detail, various representative uses of computer graphics. **(8 Marks)**

   (b) With a neat block scheme, explain the architecture of raster display system with peripheral display processor. **(8 Marks)**

   (c) Describe the video mixing function of video-controller. **(4 Marks)**

2. (a) Explain different implications of display-system architecture. **(10 Marks)**

   (b) What steps are required to scan-convert a circle using mid-point circle algorithm? Write a description of the mid-point circle algorithm in which decision parameter p is updated using x_{i+1} and y_{i+1} instead of x_i *and* y_i. **(10 Marks)**

3. (a) List out the limitations of Cohen-Sutherland line-clipping algorithm. Explain the Cyrus-Beek parametric line clipping algorithm. **(10 Marks)**

   (b) Let, $S_x = \frac{Vx_{max} - Vx_{min}}{Wx_{max} - Wx_{min}}$; *and* $S_y = \frac{Vy_{max} - Vy_{min}}{Wy_{max} - Wy_{min}}$;

   1. Express window-to-viewport mapping in the form of a composite transformation matrix.
   2. Find the normalization transformation that maps a window whose lower left corner is at (1,1) and upper right corner is at (3,5) on to

      i) a view port that is the entire normalized device screen and

      ii) a viewport that has lower left corner at (0,0) and upper right corner $\left(\frac{1}{2}, \frac{1}{2}\right)$. **(10 Marks)**

4. (a) Describe the weighted area sampling technique for antialiased lines. **(10 Marks)**

   (b) Derive transformation that rotates an object point by θ about the origin. Write the matrix representation for this rotation and obtain the matrix that represents rotation of an object by 30^0. **(10 Marks)**

5. (a) Explain the different types of orthographic projections. **(10 Marks)**

   (b) With an example, illustrate, how to compose 3D transformation matrices? **(10 Marks)**

6. (a) Give the logical classification of I/O devices. Explain an example for each. **(8 Marks)**

   (b) Explain the important design considerations for the user-interface. **(12 Marks)**

Contd.... 2

7. **(a)** With illustrations explain Bezier curves. **(10 Marks)**

(b) Write a note on polygon-meshes. **(4 Marks)**

(c) Find the geometry matrix and basic matrix for the parametric representation of a straight line. **(6 Marks)**

8. **(a)** Explain z-buffer algorithm for the removal of hidden surfaces. **(10 Marks)**

(b) Describe the following for visible surface determination :

i) List-priority algorithm

ii) Octrees. **(10 Marks)**

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Srinivas Institute of Technology
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NEW SCHEME

IS664

Reg. No.

Sixth Semester B.E. Degree Examination, January/February 2006

Information Science and Engineering

Computer Graphics

Time: 3 hrs.) (Max.Marks : 100

Note: ***Answer any FIVE full questions.***

1. (a) Explain with a neat block diagram the conceptual framework of interactive computer graphics. **(8 Marks)**

   (b) Compare random scan and rastor scan taking references to their architecture, merits and demerits. **(12 Marks)**

2. (a) How circles are scan connected ? Give the procedure to scan convert a circle. **(8 Marks)**

   (b) Explain the concept of clipping. How is it achieved to clip a straight line using Cohen - Sutherland method ? Give the appropriate pseudo-code. **(12 Marks)**

3. (a) Derive the transformation matrices for translation, scaling and rotation in homogeneous form. How can the efficiency of the transformation procedure be improved ? **(12 Marks)**

   (b) State the steps used/required to transform a world coordinate system to a view port coordinate system. Give the transformation matrix. **(8 Marks)**

4. (a) Explain different types of planar parallel projection with neat sketches. **(10 Marks)**

   (b) Briefly explain the steps involved in filling polygons. Illustrate with a neat figure. **(10 Marks)**

5. (a) Explain the procedure of drawing polyline using rubber band technique. **(10 Marks)**

   (b) Mention the different design consideration for the user interface. Briefly explain them. **(10 Marks)**

6. (a) It is required to draw a curved line in the graphical environment. How is it done using Bezier method ? **(10 Marks)**

   (b) How can BSP tree be used to represent solid objects ? Illustrate with examples. **(10 Marks)**

7. (a) Explain list priority algorithm for visible surface determination. **(10 Marks)**

   (b) Give the contents of different tables generated when a scan line algorithm for visible surface determination is executed. **(10 Marks)**

8. Write brief note on :

   (a) Image scanners

   (b) Line style and pen style

   (c) Fractal geometry - applications

   (d) Hard copy technologies. **(5×4=20 Marks)**

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Srinivas Institute of Technology
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IS664

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NEW SCHEME

Sixth Semester B.E. Degree Examination, July 2006
Information Science and Engineering
Computer Graphics

Time: 3 hrs.] [Max. Marks:100

Note: *1. Answer any FIVE full questions.*

1 a. With a neat block diagram, explain the conceptual frame work of interactive computer graphics. **(10 Marks)**

b. With a block diagram, explain the architecture of raster display system with peripheral display processor. List out its advantages and disadvantages. **(10 Marks)**

2 a. Explain Bresenham's midpoint scan conversion algorithm for lines. Derive the equations for decision variable. **(12 Marks)**

b. What is antialiasing? Explain the different methods of antialiasing. **(08 Marks)**

3 a. What is clipping? Explain Cohen – Sutherland algorithm for clipping lines. **(10 Marks)**

b. Explain the various methods of character generation and mention the advantages / disadvantages of each of them. **(06 Marks)**

c. Explain the working of any one hard copy device which needs input in vector form. **(04 Marks)**

4 a. Prove that successive rotations transformations are additive and successive scaling transformations are multiplicative. **(10 Marks)**

b. Obtain the compound homogenous transformation matrix for the following 2D transformations:
i) Rotation by an angle θ about the arbitrary point (dx, dy)
ii) Scaling by factors Sx and Sy about an arbitrary point (dx, dy). **(10 Marks)**

5 a. With neat sketches explain the different types of planner parallel projections. **(12 Marks)**

b. Explain the important design considerations for the user interface. **(08 Marks)**

6 a. Explain how a 3D object can be viewed by defining an arbitrary 3D co-ordinate system. **(10 Marks)**

b. Briefly discuss the interaction hardware. **(10 Marks)**

7 a. Explain scan line algorithm for visible surface determination. With an example obtain the contents of ET, PT and AET. **(10 Marks)**

b. Explain the B Spline Technique for generating curves. Illustrate with examples. **(10 Marks)**

8 a. Explain the Z buffer algorithm of hidden surface removal, with an example. **(10 Marks)**

b. Explain the concept of ray racing and its usefulness in visible surface determination. **(10 Marks)**

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COLLEGE OF ENGG. & TECHNOLOGY PUTTUR

NEW SCHEME

Sixth Semester B.E. Degree Examination, Dec. 06 / Jan. 07
Computer Science and Engineering
Computer Graphics

Time: 3 hrs.] [Max. Marks:100

Note : *Answer any FIVE full questions.*

1 a. With the help of neat diagrams, explain the architecture of Vector and Raster displays. **(08 Marks)**
b. What are the uses of computer graphics? **(06 Marks)**
c. Explain the working principle of CRT with neat diagram. **(06 Marks)**

2 a. How are the pixels chosen while drawing line using mid-point line drawing algorithm? Explain. **(08 Marks)**
b. Give the mid-point circle generation algorithm. **(06 Marks)**
c. Discuss any two anti-aliasing techniques. **(06 Marks)**

3 a. Give the Cohen-Sutherland line clipping algorithm. **(08 Marks)**
b. Explain polygon clipping with necessary algorithm. **(06 Marks)**
c. Write a note on character generation. **(06 Marks)**

4 a. Write the homogeneous co-ordinate transformation matrices for the three basic transformations. **(09 Marks)**
b. Give the final transformation matrix that scales the given triangle (A (2, 2), B (4, 2), C (4, 4)) twice to its size about point A. **(06 Marks)**
c. Write a note on window-to-viewport transformation. **(05 Marks)**

5 a. How do you rotate a 2D object about a point other than origin? Give the final transformation matrix. **(08 Marks)**
b. Explain the conceptual model of the 3D viewing process. **(06 Marks)**
c. Write a note on efficiency of transformation. **(06 Marks)**

6 a. Explain the position interaction task. Discuss the issues of concern to this task. **(08 Marks)**
b. How are composite interaction tasks built? Explain. **(06 Marks)**
c. What are the key goals of user interface design? **(06 Marks)**

7 a. What are Bizier curves? Discuss the properties of Bizier curves. **(08 Marks)**
b. Explain how are octrees used to represent solid objects. **(06 Marks)**
c. Write a note on fractal-geometry methods. **(06 Marks)**

8 a. Give the Z-Buffer algorithm for visible surface determination. **(08 Marks)**
b. Explain Warnock's area subdivision algorithm. **(06 Marks)**
c. Explain ray tracing giving the pseudocode for a simple ray tracer. **(06 Marks)**

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CS63

NEW SCHEME

Sixth Semester B.E. Degree Examination, July 2007
Computer Science and Engineering
Computer Graphics

Time: 3 hrs.] [Max. Marks:100

Note : ***Answer any FIVE full questions.***

1 a. What is aliasing? Explain the properties of a good line generation algorithm. **(10 Marks)**

b. Write an algorithm to generate a complete circle using mid-point technique, using eight-way symmetry function. **(10 Marks)**

2 a. Explain the edge coherence and the scan line algorithm using appropriate data structure. **(10 Marks)**

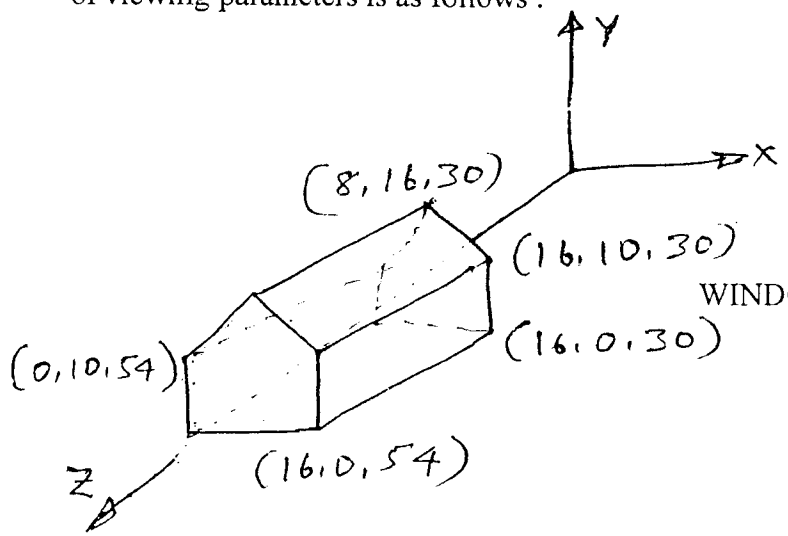
b. Describe random and Raster display systems with the help of neat sketches. **(10 Marks)**

3 a. Derive the mathematical formulation required to scale for rotate an object with respect to arbitrary axis in a 3D space. **(10 Marks)**

b. Perform a 45^0 rotation of triangle A(0, 0), B(1, 1) and C(5, 2) about the origin and about the point (–1, –1). **(10 Marks)**

4 a. Explain the following with the help of neat sketches :
i) Two-point perspective projection of a cube.
ii) Cabinet and cavalier projections. **(10 Marks)**

b. Obtain the front one-point perspective view of the house shown below, the overall set of viewing parameters is as follows :



VRP(WC) 0, 0, 0
VPN(WC) 0, 0, 1
VUP(WC) 0, 1, 0
PRP(VRC) 8, 6, 84
WINDOW(VRC) (–50, 50, – 50, 50)
Projection Type Perspective

i) Sketch the output view for the above case
ii) To produce more centered projection of the house, which extends 0 to 16 in both x and y (a window extending from –1 to 17 in x and y direction) write the corresponding set of viewing parameters. **(10 Marks)**

Contd.... 2

5 a. Explain the concept of data Glove as a 3D interaction device, with the help of sketches. **(10 Marks)**

b. Explain the three common styles for user computer interfaces (dialogue forms). **(10 Marks)**

6 a. Write the pseudocode for the Z-buffer algorithm and explain its working principle to sort the objects/planes in Z-direction using plane equation. **(10 Marks)**

b. Explain the following concepts in hidden surface elimination process :

i) Area-subdivision algorithm

ii) BSP-Trees. **(10 Marks)**

7 Explain the following with the help of neat sketches.

a. Mathematical formulation for cubic Bezier curves and sketch the blending functions (for n = 3). **(10 Marks)**

b. List the properties of B-spline curve and derive the B-spline basis matrix M_B. **(10 Marks)**

8 Write short notes for the following :

a. Light pen

b. Character generation in graphics mode

c. Window to viewport transformation

d. Geometric construction of deterministic self similar fractals. **(20 Marks)**

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CS63

Sixth Semester B.E. Degree Examination, Dec. 07 / Jan. 08
Computer Graphics

Time: 3 hrs. Max. Marks:100

Note : ***Answer any FIVE full questions.***

1 a. Explain the representative uses of computer graphics. **(06 Marks)**
b. With a neat block diagram discuss the architecture of Raster display system with peripheral display processor. **(08 Marks)**
c. Discuss the additional display processor functionality. **(06 Marks)**

2 a. Explain the Bresenham's midpoint line algorithm. Also derive the expressions for decision variable. **(12 Marks)**
b. Illustrate the algorithm for filling a polygon with an example and discuss the use of bucket sorted edge table and active edge table. **(08 Marks)**

3 a. With neat sketch explain the implementation of Cyrus-beck parametric line clipping algorithm. Tabulate the calculations required. **(12 Marks)**
b. What is antialiasing? Explain how it is implemented. **(08 Marks)**

4 a. Explain with an example the steps involved in transformation from a window in world coordinates to viewport in screen coordinates. Determine the composite transformation matrix. **(10 Marks)**
b. A square in a two dimensional system is specified by its vertices (6, 6), (10, 6), (10, 10) and (6, 10). Implement the following by first finding a composite transformation matrix for the sequence of transformations involved. Sketch the original and transformed square.
i) Rotate the square by 45^0 about its vertex (6, 6)
ii) Scale the original square by a factor of 2 about its center. **(10 Marks)**

5 a. Give the classification of planar geometric projections. Explain with neat sketches the parallel and perspective projections. **(12 Marks)**
b. Discuss the following terminologies as applied to a 3D view specification :
i) VPN ii) VRP iii) PRP iv) VRC v) View volume.
Specify the 3D view specifications for a front parallel projection with an example. **(08 Marks)**

6 a. List the basic interaction tasks. Discuss in detail any one of them. **(10 Marks)**
b. Explain the important design considerations in dialogue design. **(10 Marks)**

7 a. Illustrate the B-spline technique of generating curves with examples. **(10 Marks)**
b. Explain the following techniques used for efficient visible surface algorithms :
i) Extents and boundary volumes
ii) Back face culling. **(10 Marks)**

8 a. Explain the scan line algorithm for visible surface determination with an example. Obtain the contents of ET, PT and AET. **(12 Marks)**
b. Explain the visible surface ray tracing and write the pseudocode for a simple ray tracer. **(08 Marks)**

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IS664

Sixth Semester B.E. Degree Examination, Dec. 07 / Jan. 08
Computer Graphics

Time: 3 hrs. Max. Marks:100

Note : *Answer any FIVE full questions.*

1 a. With a neat block diagram explain the conceptual framework for interactive graphics. (06 Marks)

b. Explain the different representative uses of computer graphics. (08 Marks)

c. Explain the logical organization of video controller in Raster display system. (06 Marks)

2 a. Explain midpoint circle generating algorithm with derivations of equations for the decision variable. (10 Marks)

b. Obtain co-ordinate points for a straight line whose end points are (20, 10) and (30, 18) using Bressemhaum's line drawing algorithm. (10 Marks)

3 a. What is meant by clipping? Explain Cohen Sutherland line clipping algorithm. (10 Marks)

b. Given the window parameters (x_{min}, x_{max}, y_{min}, y_{max}) as (5, 30, 15, 25) clip the lines BC, DA whose end coordinates are D(15, 37), A(10, 18), B(22, 18) and C(34, 27), using Liang Barskey line clipping algorithm. (10 Marks)

4 a. Explain different basic transformations in 3D and represent them in matrix form. (10 Marks)

b. Magnify the triangle with vertices A(0, 0), B(1, 1), C(5, 2) to twice its size while keeping the point C(5, 2) fixed. Get the coordinates of translated vertices. (10 Marks)

5 a. With neat diagrams explain different types of planar parallel projections. (10 Marks)

b. Give the logical classifications of I/O devices. With one example explain each class briefly. (10 Marks)

6 a. Explain different user interface styles with example. (06 Marks)

b. Explain Bezier curve with the properties. (04 Marks)

c. Discuss different types of basic interaction tasks. (10 Marks)

7 a. Explain the working of Z-buffer method for visible surface determination with algorithm. (10 Marks)

b. Describe binary space partitioning tree method for visible surface determination with algorithm. (10 Marks)

8 Write short notes on :

a. Antialiasing

b. Edge coherence and scan line algorithm for polygon filling

c. Scan line method for visible surface determination

d. Octtrees. (20 Marks)

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06CS65

Sixth Semester B.E. Degree Examination, June-July 2009
Computer Graphics and Visualization

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the concept of pinhole camera which is an example of an imaging system. Derive the expression for angle of view. Also indicate the advantages and disadvantages of this. **(10 Marks)**

b. With an aid of a functional schematic, describe graphics pipeline with major steps in the imaging process. **(10 Marks)**

2 a. Write an Open GL program for a 2 – D Sierpinski gasket using mid – point of each of triangle. Indicate the assumptions made in generating the above. **(10 Marks)**

b. Briefly explain the orthographic viewing with open GL functions for 2 – D and 3 – D viewing. Indicate the significance of projection plane and the viewing point in this. **(10 Marks)**

3 a. What are the various classes of logical input devices that are supported by open GL? Explain the functionality of each of these classes. **(09 Marks)**

b. Enlist the various features that a good interactive program should include. **(04 Marks)**

c. Suppose that the open GL window is 500 x 500 pixels and the clipping window is a unit square with the origin at the lower left corner. Use simple XoR drawing mode to draw erasable lines using open GL code. Also elicit as to how the first end points of the object coordinates are obtained and stored. **(07 Marks)**

4 a. Explain the complete procedure of converting a world object frame into camera or eye frame, using the model view matrix. **(10 Marks)**

b. With regard to modeling discuss the following:
i) Data structures for object representation.
ii) Bilinear interpolation
iii) Vertex arrays. **(10 Marks)**

PART – B

5 a. Write an openGL program that allows to orient the cube with one mouse button, to translate it with a second and to 200m in and out with a third. **(10 Marks)**

b. What are quaternions? With illustrative example, explain how quaternions are used in rotations in a three – dimensional space. Give the mathematical representations of quanternions. **(10 Marks)**

6 a. With neat sketches, explain the various types of views that are employed in computer graphics systems. **(10 Marks)**

b. Briefly discuss the following along with the functions used for the purpose in openGL.
i) Perspective projections
ii) Orthogonal projections. **(10 Marks)**

7 a. Explain the Phong lighting model. Indicate the advantages and disadvantages of this model. **(10 Marks)**

b. What are the different methods available for shading a polygon? Briefly discuss any two of them. **(10 Marks)**

8 a. Explain the concept of polygon clipping with neat sketches. What is the necessity of it? Can we apply Cohen – Sutherland and Liang – Barsky algorithms for clipping the polygons? If so, how it is done? Explain. **(10 Marks)**

b. Discuss the Bresenham's rasterization algorithm. How is it advantageous when compared to other existing methods? Describe. **(10 Marks)**

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Srinivas Institute of Technology
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06CS65

Sixth Semester B.E. Degree Examination, Dec.09/Jan.10
Computers Graphics and Visualization

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

Part – A

1 a. Explain the graphics system, with a diagram. **(08 Marks)**
b. With a neat block diagram, explain the graphics pipeline architecture. **(12 Marks)**

2 a. List out different open GL primitives, giving examples for each. **(08 Marks)**
b. Write an open GL recursive program for 3D Sierpinski Gasket, with relevant comments. **(12 Marks)**

3 a. Differentiate event mode with request mode. **(04 Marks)**
b. Describe logical input operation of picking in selection mode. **(06 Marks)**
c. Write an open GL program to draw a rectangle and move the rectangle to the need position centered at mouse cursor. **(10 Marks)**

4 a. List the geometric objects and associated operations in affine space. **(06 Marks)**
b. Explain the procedure involved in transforming the world frame to camera / eye frame, with an example. **(08 Marks)**
c. How is the affine transformation advantageous in open GL? **(06 Marks)**

Part – B

5 a. What is a homogeneous co-ordinate system? Using this co-ordinate system, represent all the basic 2D transformations. **(12 Marks)**
b. Write an open GL program to rotate a cube about x, y and z axes. Use mouse buttons to select axis of rotation. Use glRotatef( ) function. **(08 Marks)**

6 a. Derive the projection matrices for perspective viewing. **(12 Marks)**
b. Explain gluLookAt function. **(04 Marks)**
c. Write a note on hidden surface removal. **(04 Marks)**

7 a. Give the different classification of light material interactions. How are these supported in open GL? **(08 Marks)**
b. Describe Phong Lighting Model. **(12 Marks)**

8 a. Write Liang Barsky line clipping algorithm. **(10 Marks)**
b. Explain Bresenham's line rasterization algorithm. **(10 Marks)**

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Sir M. Visvesvaraya Institute of Technology
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06CS65

Sixth Semester B.E. Degree Examination, May/June 2010
Computer Graphics and Visualization

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Discuss the applications of computer graphics. **(04 Marks)**

b. Giving the block diagram, explain the high-level view of a graphics system. **(06 Marks)**

c. Explain the different graphics architectures. **(06 Marks)**

d. Write a fragment of a simple program in pen plotter model that would generate the output shown in Fig.Q1(d). **(04 Marks)**

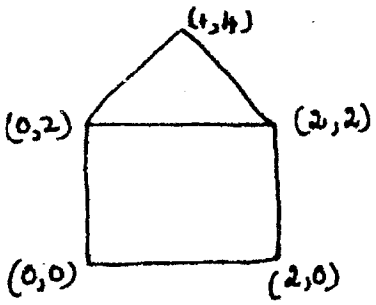

Fig.Q1(d)

2 a. Write a typical main function that works for moot non-interactive applications and explain each function call in it. **(10 Marks)**

b. Explain the major groups of graphics functions. **(07 Marks)**

c. Differentiate additive color model from subtractive color model. **(03 Marks)**

3 a. What are the major characteristics that describe the logical behaviour of an input device? Explain how open GL provides the functionality of each of the classes of logical input devices. **(08 Marks)**

b. What is a display list? Give the open GL code segment that generates a display list defining a red triangle with vertices at (50, 50), (150, 50) and (100, 150). **(07 Marks)**

c. What is double buffering? How is it implemented in open GL? **(05 Marks)**

4 a. Explain the different open GL frames. **(07 Marks)**

b. Explain bilinear interpolation method of assigning colors to points inside a quadrilateral. **(06 Marks)**

c. Explain the properties that ensure that a polygon will be displayed correctly. **(03 Marks)**

d. Explain the following: **(04 Marks)**
i) Point-vector addition ii) Homogeneous coordinates.

PART – B

5 a. Explain the basic transformations in 3D and represent them in matrix form. **(07 Marks)**

b. What are the entities required to perform a rotation? Show that two rotations about the same axis commute. **(07 Marks)**

c. What is concatenation? How does it affect the efficiency of transformations? **(04 Marks)**

d. What are the advantages of quaternions? **(02 Marks)**

6 a. Bring out the differences between perspective and parallel projections. **(07 Marks)**
b. Derive the simple perspective projection matrix. **(05 Marks)**
c. What is projection normalization? **(03 Marks)**
d. Explain the z – buffer algorithm giving its pseudo code. **(05 Marks)**

7 a. What are the various methods available for shading a polygonal mesh? **(07 Marks)**
b. Write the open GL code segment to approximate a sphere using subdivision. **(05 Marks)**
c. Explain the different types of light sources supported by open GL. **(08 Marks)**

8 a. Use the Liang Barsky line – clipping algorithm to clip the line $P_1(-15, -30)$ to $P_2(30, 60)$ against the window having diagonally opposite corners at (0, 0) and (15, 15). **(07 Marks)**
b. Digitize the line from (10, 16) to (16, 12) using the DDA algorithm. **(06 Marks)**
c. Clip the polygon given in Fig.Q8(c) using the Sutherland Hodgeman polygon clipping algorithm. **(07 Marks)**

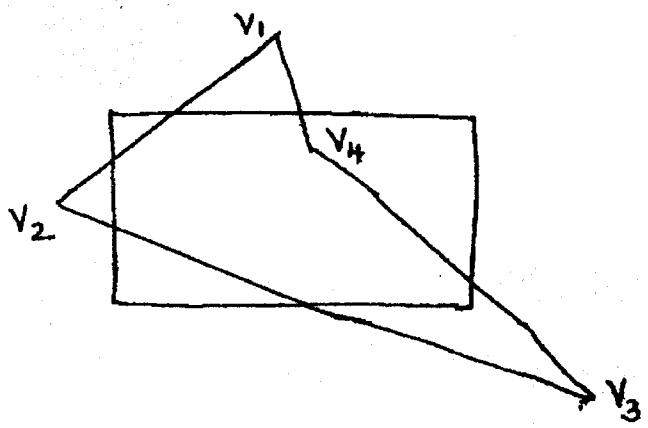

Fig.Q8(c)

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