Printed Pages : 3

Roll No. .....

ii) Questions : 7

Sub. Code : 6 8 5 2

Exam. Code : 9 2 3

B. Engg. (Information Technology) 5th Semester

1125

COMPUTER GRAPHICS

Paper– IT–522/532

Time Allowed : Three Hours] **[Maximum Marks : 50**

Note:– There are total 7 questions. **First** question is compulsory. Attempt total **five** questions selecting at least **2** from each part.

1. (a) What do you mean by interactive computer graphics ?
   (b) Explain the role of frame buffer and display adapter in computer graphics.
   (c) What are emissive and non-emissive displays ?
   (d) What is halftoning ? Give its application.
   (e) Give two applications of using segments in computer graphics application.
   (f) What is the need of using homogenous coordinate systems in generating composite matrix transforms ?
   (g) Explain shear transformation.
   (h) What is the difference between 2D and 3D viewing ?
   (i) What is a principle vanishing point ?
   (j) What is the difference between object-space and image-space methods ? 10×1=10

Qn 5 a) Explain the window
matrix.
b) Illustrate the workin
time complexity?

PART–A

2. (a) What is scan conversion ? Compare and contrast Random scan and Raster scan systems.

(b) Explain in brief :

(i) Shadow mask CRT

(ii) Any graphics input device

(iii) Winding number rule

(iv) Character generation methods

(v) Inverse transformation. 5

3. (a) What is aliasing ? Discuss one software and one hardware anti-aliasing technique. 5

(b) Illustrate the working of DDA algorithm using suitable example. 5

4. (a) Show that transformation matrix for a reflection about a line $y = x$ is equivalent to reflection to x-aixs followed by counter clockwise rotation of 90 degree. 5

(b) What is segment renaming ? Discuss some efficient methods for storing segments in memory. 5

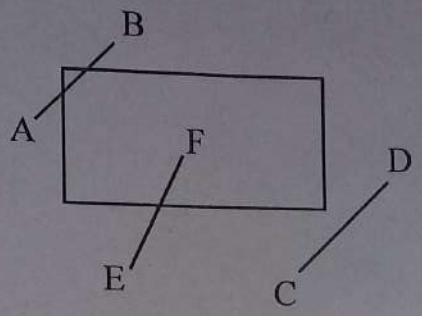
PART–B

5. (a) Explain the role of following with respect to window to viewport transformation :

(i) Coordinate transformation

(ii) Normalized coordinates. 5

(b) Discuss the key features of Cohen Sutherland and Sutherland Hodgman algorithms for clipping. Illustrate the working of the line clipping algorithm for lines AB, CD and EF in the following window :



5

6. (a) Explain the 3D viewing pipeline and the various 3D viewing parameters. 5

(b) A 3D object is scaled (scaling factor : Sx = 4, Sy = 3, Sz = 3), translated (translation factors Tx = 10, Ty = 10, Tz = –5) and then rotated about an axis x = 7 by 30 degree. Compute the composite matric transformation. 5

7. (a) Differentiate between parallel and perspective projection. Also discuss their types with suitable examples. 5

(b) Illustrate the working of any two visible surface detection methods. 5

[Turn over

Exam.Code:923
Sub. Code: 6851

1065

B.E./B.E.M.B.A. (Information Technology) Fifth Semester

IT-522/532: Computer Graphics

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory selecting two questions from each Part.

x-x-x

Qn 1

i. Explain sampling with respect to digital images.
ii. What is the relation between the size of frame buffer and image quality?
iii. Explain the winding number test.
iv. If we want to resize a 1024 x 768 image to one that is 640 pixels wide with same aspect ratio, what would be the height of the resized image?
v. What is inverse transformation?
vi. What is the difference between a window and a viewport?
vii. Explain vanishing point by citing an example from the real world.
viii. What is the need of homogeneous coordinates?
ix. What do you mean by back face detection?
x. What is halftoning?

(10 x 1 = 10 marks)

PART - A

Qn 2 a) How is random scan different from raster scan? Discuss application area of each.
b) Explain the working principle of i) light pen ii) touch screen devices.

(5,5)

Qn 3 a) Compare the advantages and drawback of DDA and Bresenham's line drawing algorithms. For any given line, illustrate how we can calculate the line pixels (first three pixel positions) using these algorithms.
b) Explain the data structures used for storing segments. How can we add and delete a segment.

(6,4)

Qn 4 a) Given a triangle having vertices A(50,60), B(35,30),C(70,40). The triangle is first rotated by 90 degree, then scaled with Sx = 2 and Sy= -2, and finally translated to position Tx= 100, Ty=50. Find the composite matrix transform.
b) Explain i) Aliasing ii) Flood fill algorithm, using suitable examples.

(6,4)

PART – B

Qn 5 a) Explain the window to viewport mapping and derive its corresponding transformation matrix.
b) Illustrate the working of Sutherland –Hodgman algorithm? How can we improve its time complexity?

(5,5)

Qn 6 a) What is the role of projections in generating computer graphics? Explain the various types of perspective projections.
b) What are the various 3D viewing parameters? Explain using a labelled diagram.

(5,5)

Qn 7 What is the objective of designing visible surface detection methods? Illustrate the working of the Z-buffer and A-buffer algorithms using suitable example. **(10)**

x-x-x

Exam.Code:0923
Sub. Code: 6847

1127

B.E. (Information Technology)
Fifth Semester
ITE-542/532: Computer Graphics

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt <u>five</u> questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.*

x-x-x

Q1 Answer the following:

(a) What are the various components of a virtual reality system? 1
(b) What is pixel addressing? 1
(c) State nonzero winding number rule. 1
(d) What are the different representations for storing computer fonts? 1
(e) Write down various line attributes. 1
(f) Why homogeneous coordinates are used in transformations? 1
(g) Give the classification of visible surface detection methods. 1
(h) What is perspective projection? 1
(i) How viewing coordinates are specified in 2D? 1
(j) What is stereoscopic viewing? 1

SECTION-A

Q2 a) A triangle having vertices (2,3) (6,3) and (4, 8) is reflected about the line x=0. Find the final position of the triangle using 2D transformation. 5

b) Why refreshing is required in CRT? Briefly explain the interlaced refresh procedure. 5

Q3 a) Explain the inside-outside tests with suitable example. 5

b) Explain the different representations for storing computer fonts. 5

Q4. Explain Cohen Sutherland line clipping algorithm with example. 10

SECTION-B

Q5 a) Define the term 'continuity' as used to describe splines in computer graphics. What is parametric and geometric continuity? 5

b) Briefly explain the Beizer curves and their properties. 5

Q6 Briefly explain how to setup the view plane in 3D. Also explain how different views of the same scene can be obtained? 10

Q7. Explain the depth buffer visible surface detection method. Also explain how coherence can be used to reduce the number of computations required in the method. 10

x-x-x

x-x-x

Exam.Code:0923
Sub. Code: 6847

1128

B.E. (Information Technology)
Fifth Semester
ITE-542/532: Computer Graphics

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.

x-x-x

I. Attempt the following:-

a) Differentiate between random scan ad raster scan.

b) What is a principle vanishing point?

c) Explain the working of light pen?

d) Discuss the need of homogenous coordinates and composite matrix.

e) Differentiate between window and a viewport. (5x2)

UNIT – I

II. a) What is a color table? Explain the working of any two color display devices.

b) What is geometric transformation? Rotate the polygon with co-ordinates A(2,5),B(7,10) and C(10,2) by 30 degree and the scale by factors Sx=2 and Sy=3. (5,5)

III. a) Illustrate the working of Sutherland Hodgeman algorithm. How can the efficiency and speed of clipping operation be improved?

b) Explain the scan-line polygon filling algorithm. Differentiate between flood fill and boundary fill using suitable example. (5,5)

IV. a) Consider the line from (5,5) to (13,9). Illustrate the output of DDA and Bresenham's algorithm to rasterize this line. Discuss the key advantages of Bresenham's algorithm.

b) Explain: anti-aliasing techniques. Character generation, Shear transformation. (5,5)

UNIT – II

V. a) Discuss some 3D display methods. Discuss the role of view plane normal, viewing distance and specified in 3D coordinate system?

b) Explain translation and rotation in 3D coordinate system? Illustrate with suitable examples using the corresponding transformation matrices. (5,5)

P.T.O.

VI. a) What are projections? Discuss various types of parallel and perspective projection.

b) Explain the representation of spline curves. Discuss the characteristics of Cubic splines and B-Spline curves. (5,5)

VII. a) Discuss the classification of visible surface detection methods. What is Back face detection?

b) Discuss A-buffer algorithm and the requisite data structure with suitable example. (5,5)

x-x-x

Exam.Code:0923
Sub. Code: **6847**

1127

B.E. (Information Technology)
Fifth Semester
ITE-542/532: Computer Graphics

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt <u>five</u> questions in all, including Question No. I which is compulsory and selecting two questions from each Section.*

x-x-x

Q1 Answer the following:

(a) What are the various components of a virtual reality system? 1
(b) What is pixel addressing? 1
(c) State nonzero winding number rule. 1
(d) What are the different representations for storing computer fonts? 1
(e) Write down various line attributes. 1
(f) Why homogeneous coordinates are used in transformations? 1
(g) Give the classification of visible surface detection methods. 1
(h) What is perspective projection? 1
(i) How viewing coordinates are specified in 2D? 1
(j) What is stereoscopic viewing? 1

SECTION-A

Q2 a) A triangle having vertices (2,3) (6,3) and (4, 8) is reflected about the line x=0. Find the final position of the triangle using 2D transformation. 5

b) Why refreshing is required in CRT? Briefly explain the interlaced refresh procedure. 5

Q3 a) Explain the inside-outside tests with suitable example. 5

b) Explain the different representations for storing computer fonts. 5

Q4. Explain Cohen Sutherland line clipping algorithm with example. 10

SECTION-B

Q5 a) Define the term 'continuity' as used to describe splines in computer graphics. What is parametric and geometric continuity? 5

b) Briefly explain the Beizer curves and their properties. 5

Q6 Briefly explain how to setup the view plane in 3D. Also explain how different views of the same scene can be obtained? 10

Q7. Explain the depth buffer visible surface detection method. Also explain how coherence can be used to reduce the number of computations required in the method. 10

x-x-x

1127

Exam.Code:0917
Sub. Code: 6787

B.E. (Computer Science and Engineering)
Fifth Semester
CS-502: Computer Graphics

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section.*

x-x-x

I. Write short answers of the following:
a. In context of raster scan systems, what do you mean by interlacing?
b. What is aspect ratio? Can aspect ratio be equal to 1?
c. Define window and viewport.
d. What are homogenous coordinates? How points at infinity can be represented using homogenous coordinate system?
e. What do you mean by perspective foreshortening?

Section-A

II.
a. Describe in detail Bresenham's algorithm for generating line segments. Derive the expressions for the decision parameters. How is Bresenham's algorithm better than DDA algorithm for generating line segments?
b. Using mid-point circle generation algorithm, compute the coordinates of points that lie on the circumference of the circle with radius 6 and centre as (8,8).

III.
a. Describe in detail Weiler-Atherton polygon clipping algorithm. How is it advantageous over Sutherland-Hodgeman polygon clipping algorithm?
b. Reflect the diamond-shaped polygon whose vertices are A(-1,0), B(0,-2), C(1,0), and D(0,2) about the line y=x+2.

IV.
a. 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 viewport that is the entire normalized device screen.
b. Describe in detail the working of raster-scan systems and random-scan systems.

Section-B

V.
a. Describe in detail painter's algorithm for hidden surface elimination.
b. Using the origin as the centre of projection, derive the perspective transformation onto the plane passing through the point $R_0(x_0, y_0, z_0)$ and having the normal vector $N = n_1 I + n_2 J + n_3 K$.

VI.
a. Find a transformation A_v which aligns a given vector V with the vector K along the positive z axis.
b. Describe in detail Gouraud's method for smooth shading.

VII. Write short notes on:
a. Design of Animation Sequences
b. Bezier and B-spline Curves

x-x-x