COMPUTER GRAPHICS (RCS-063)
B.TECH (CSE) 3rd YEAR,
2019-2020

AKTU Questions Papers:
2012-13 * 2014-15 * 2015-16 * 2016-17

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(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2167 Roll No. | | | | | | | | | | |

B.Tech.

(SEMESTER-V) THEORY EXAMINATION, 2012-13

COMPUTER GRAPHICS

Time : 2 Hours] *[Total Marks : 50*

Section – A

1. Attempt **all** parts each carry equal marks (2 marks each). **5 × 2 = 10**

   (a) Give window to viewport transformation matrix.

   (b) Where and why clipping is needed in graphics ?

   (c) Explain Phong illumination model in brief.

   (d) Give parametric and non-parametric representation of curve in 3-D.

   (e) We require large refresh rate mainly due to short persistence of phosphor. Why not use a long persistence of phosphor instead to reduce the frame rate ?

Section – B

(Solve 3 questions out of 5 questions.) **5 × 3 = 15**

2. (a) Explain Sutherland-Hodgman polygon-clipping algorithm. Why this algorithm works for only convex clipping region ?

   (b) Implement a back-face detection procedure using an orthographic parallel projection to view visible faces of a convex polyhedron. Assume that all parts of the object are in front of the view plane and provide a mapping onto a screen viewport for display.

   (c) Show that the composition of two rotations is additive by concatinating the matrix representations for $R(\theta_1)$ and $R(\theta_2)$ to obtain

$$R(\theta_1) * R(\theta_2) = R(\theta_1 + \theta_2)$$

(d) Design a parallel version of Bresenham's algorithm for straight liens of any slope.

(e) Write a procedure to transform the vertices of a polyhedron to projection coordinates using a parallel projection with a specified projection vector.

Section – C

(All questions are compulsory and carry equal marks.) **5 × 5 = 25**

3. Explain with example – Warnock algorithm for hidden surface removal. Also draw the window tree structure for the same example.

OR

Consider three different raster systems, with resolutions of 640 × 400, 1280 × 1024 and 2560 × 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 ?

4. Write and explain with example Weiler and Atherton polygon clipping algorithm.

OR

Write a routine to perform both interior and exterior clipping, given a particular window system display. Input to the routine is a set of window positions on the screen, the objects to be displayed in each window, and the window priorities. The individual objects are to be clipped to fit into their respective windows, then clipped to remove parts with overlapping windows of higher display priority.

5. Write a program to shear an object with respect to any of the three coordinate axes, using input values for the shearing parameter.

OR

Draw the block diagram of implementation of 3-D viewing, while converting 3-D world coordinate output primitive to 2-D device coordinate. Also explain the functionality of each block.

6. Consider the four two-dimensional position vectors $P_1[\ 0\ 0]$, $P_2[\ 1\ 1]$, $P_3[-2\ \ -1]$, $P_4[3\ 0]$. Determine the piecewise cubic spline curve through them using the chord approximation for the t_k's. The tangent vectors at the ends are $P'_1[\ 1\ \ 1]$ and $P'_4[1\ \ 1]$. Calculate intermediate points at $\tau = 1/3, 2/3$ for each segment.

OR

Develop a program to implement the scan-line algorithm for displaying the visible surfaces of a given polyhedron. Use polygon and edge tables to store the definition of the object and use coherence techniques to evaluate points along and between scan lines.

7. Show that two successive reflections about either of the coordinate axes is equivalent to a single rotation about the coordinate origin.

OR

Explain in brief RGB, YIQ, CMY and HSV colour models in detail.

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ECS-504

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 110504

Roll No. | | | | | | | | | | |

B. Tech.

(SEM. V) (ODD SEM.) THEORY EXAMINATION, 2014-15

COMPUTER GRAPHICS

Time : 2 Hours] [Total Marks : 50

1 Attempt any **two** parts of the following : **(2×6=12)**

(a) Differentiate between Random and Raster scan system with example.

(b) Write DDA algorithm for line drawing. Rasterized the line between the points (20, 10) and (30, 18) by using the same.

(c) Explain the working of colour CRT by using delta shadow mask method.

2 Attempt any **two** parts of the following : **(2×7=14)**

(a) Write Liange Barsky algorithm for Line Clipping. Use Liange Barsky line clipping algorithm to clip the line P1(-15,-30) to P2(30,60) against the window having diagonally opposite corners as (0,0) and (15,15).

(b) Explain concave and convex polygons with proper example. Discuss Sutherland-Hodgeman polygon clipping algorithm by all possible cases.

(c) Rotate a triangle at A (0,0), B(1,1), C(5,2) by 45^0 about :

(i) Origin (0,0)

(ii) Point P(-1,-1). Find new coordinates of the rotated figure.

3 Attempt any **two** parts of the following : **(2×6=12)**

(a) Find the coordinates of a pyramid whose coordinates are A(0,0,0), B(1,0,0), C(0,1,0) and D(0,0,1) after mirror reflection with respect to the plane passing through the origin and having the normal vector N = i+j+j.

(b) What is Projection ? Derive oblique parallel projection and perspective projection matrices.

(c) Derive a general form of 3D rotation about :

(i) X-axis

(ii) Z-axis

4 Attempt any **two** parts of the following : **(2×6=12)**

(a) What is the importance of hidden line and surface removal algorithm ? Discuss the mechanism of Z-buffer surface removal algorithm and differentiate it with A-buffer surface removal algorithm.

(b) Specify the significance of continuity conditions. Discuss parametric continuity conditions and differentiate it with geometric continuity conditions.

(c) Explain diffuse reflection and Gouraud model.

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 110514 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. V) THEORY EXAMINATION, 2015-16

COMPUTER GRAPHICS

[Time : 3 hours] [MaximumMarks : 100]

Note : Attempt questions from all Sections as per directions.

Section-A

1. Attempt *all parts* of this section. Answer in brief. (2×10=20)

   (a) Give window to viewport transformation matrix.

   (b) We require large refresh rate mainly due to short persistence of phosphor. Why not use a long persistence of phosphor instead to reduce the frame rate?

   (c) What is resolution?

   (d) Define computer graphics.

   (e) Define polygon.

(f) What is transformation?

(g) What is translation?

(h) Define clipping.

(i) Define B-Spline curve

(j) What is a spline?

Section-B

Attempt *any five* questions from this section.

(10×5=50)

2. Rotate a triangle at A (0, 0), B (1, 1), C (5, 2) by 45° about:

   (i) Origin (0, 0)

   (ii) Point P (-1, -1). Find new coordinates of the rotated figure.

3. Write Liangle Barsky algorithm for line clipping. Use Liange Barsky line clipping algorithm to clip the line P1 (-15, -30); to P2 (30, 60) against the Window having diagonally opposite corners as (0, 0) and (15, 15).

4. What is the importance of hidden line and surface removal algorithm? Discuss the mechanism of Z-buffer surface removal algorithm and differentiate it with A-buffer surface removal algorithm.

5. Show that the uniform scaling and rotation make commutative pairs but in general scaling and rotation are not commutative.

6. Implement a back-face detection procedure using an orthographic parallel projection to view visible faces of a convex polyhedron. Assume that all parts of the object are in front of the view plane and provide a mapping onto a screen viewport for display.

7. Show that the composition of two rotations is additive by concatenating the matrix representations for R (θ 1) and R (θ2) to obtain R (θ1) * R (θ2) =: R (θ1+θ2)

8. Explain with example - Warnock algorithm for hidden surface removal. Also draw the window tree structure for the same example.

9. Design a parallel version of Bresenham's algorithm for straight lines of any slope.

Section-C

Attempt *any two* questions form this section.

(15×2=30)

10. (a) Write and explain with example weiler and Atherton polygon clipping algorithm.

    (b) Explain the working of colour CRT by using delta shadow mask method.

11. Write short notes on any two of the following:

(a) 3-D transformation

(b) 3-D projection

(c) 3-D clopping

12. (a) Write an algorithm to draw Bezier curves.

(b) What are the various back face detection algorithms? Explain anyone of them.

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Printed Pages : 1 **Roll No.** | | | | | | | | | | | **NCS403**

B.TECH.

THEORY EXAMINATION (SEM–IV) 2016-17

COMPUTER GRAPHICS

Time : 3 Hours ***Max. Marks : 100***

Note : *Be precise in your answer. In case of numerical problem assume data wherever not provided.*

SECTION – A

1. Explain the following: 10 x 2 = 20

(a) Why do we need video controller?

(b) Trace the points for drawing a line from (0,0) to (-6,-6) using simple DDA algorithm.

(c) Define refresh buffer.

(d) Give the transformation matrix for rotation about an arbitrary point P in space.

(e) Prove that the two successive rotations are commutative.

(f) Write how shear transformation works.

(g) List the properties of B-spline curves.

(h) Differentiate between specular reflection and diffuse reflection.

(i) How a viewport differs from the window?

(j) What do you mean by aliasing and antialiasing? Give examples

SECTION – B

2. Attempt any five parts of the following questions: 5 x 10 = 50

(a) Develop the Bresenham's line drawing to draw lines of any scope. Compare this with the DDA Algorithm.

(b) Given a 25cm x 20cm display operating in 1024 x 768 x 16 color mode which is refreshed 30 times per second, and for which 10% of the refresh cycle is spent in retrace, calculate

(i) the pixel aspect ratio,

(ii) the size of the frame buffer, and

(iii) the required data transfer rate in kilobytes per second.

(c) Given a window bordered by (1,2) at the lower left and (16,12) at the upper right, give the screen coordinates of a triangle with vertices (3,2), (10,7.5) and (5,5) when mapped into a viewport with corners (100,100) and (400,200). Provide accurate illustrations of the window, viewport, and the untransformed and transformed triangles with your answer.

(d) Explain the essential difference between the "Scan-Line" hidden surface removal algorithm and the depth buffer technique.

(e) Write the way of clipping a line using Cohen Sutherland algorithm.

(f) Give a detailed explanation about quadratic surfaces and polygon surfaces.

(g) Write down the detailed description of Warn model.

SECTION – C

Attempt any two parts of the following questions: 2 x 15 = 30

3 The figure ABCD where A=(-2,0), B=(0,-2), C=(-2,-4) and D=(-4,-2) can be transformed into A'B'C'D' where A'=(1,-1), B'=(3,3), C'=(6,3) and D'=(4,-1) by the composition of simple transforms T2*H1*S1*R1*T1. Give the matrix form of these five transformations. Then express the composite transform using only one scale, one rotation and one translation.

4 Explain Area Subdivision algorithm with suitable figure? List the advantages and disadvantages of Area Subdivision algorithm.

5 Discuss in detail about visible surface detection methods.