

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 6091

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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 $[T] = \begin{pmatrix} \frac{1-t^2}{1+t^2} & \frac{2t}{1+t^2} \\ \frac{2t}{1+t^2} & \frac{1-t^2}{1+t^2} \end{pmatrix}$ 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?

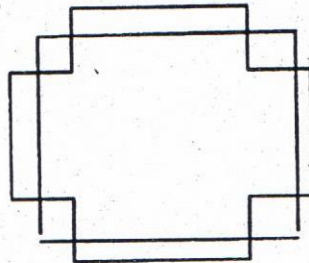
(3)

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

(3)

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- (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)