Your Roll No. :.....

Sl. No. of Q. Paper : 1341

Unique Paper Code : **32341602**

Name of the Course : **B.Sc. (H) Computer Science**

Name of the Paper : **Computer Graphics**

Semester : **VI**

Time: **3 hours** Maximum Marks: **75**

Instructions for Candidates:

a) Write your Roll No. on the top immediately on receipt of this question paper.
b) Attempt **all** questions from **Section A.**
c) Attempt any **four** questions from **Section B.**
d) Attempt **all** parts of a question together.

Section A

1	(a)	Write the geometric vectors for Hermite and Bezier curve.	2
	(b)	What is odd parity rule for filling polygon?	2
	(c)	Write steps to design an animation sequence.	2
	(d)	Two dimensional rotations are commutative. State whether true or false. Justify your answer.	2
	(e)	How much time is spent scanning across each row of pixels during screen refresh on a raster system with a resolution of 1280 by 1024 and a refresh rate of 80 frames per second?	2
	(f)	Define tints and tones of a color.	2
	(g)	What are affine transformations? Give suitable example.	2
	(h)	Differentiate between parallel and perspective projections.	3
	(i)	What is anti-aliasing? Briefly describe any one anti-aliasing method.	3
	(j)	Scan convert first four points of a line segment from (3, 4) to (13, 9) using DDA line drawing algorithm.	3
	(k)	Illustrate the structure of global edge table and active edge table used in scan fill algorithm with the help of example.	4
	(l)	Using homogenous co-ordinates, magnify the triangle with vertices A (0, 0), B (1, 1) and C (5, 2) to thrice its size while keeping B (1, 1) fixed.	4
	(m)	Explain depth sort algorithm for visible surface detection.	4

Section B

2	(a)	Clip the polygon given in Fig. 1 with respect to rectangular window ABCD using Sutherland Hodgeman polygon clipping algorithm. Show four stages of the clipping algorithm as the polygon is clipped by the right, top, left and bottom edges of window ABCD.	5

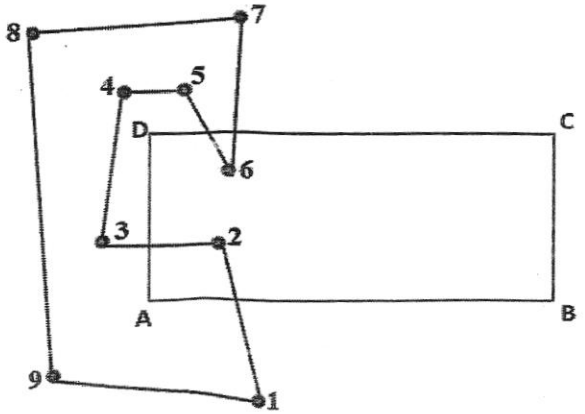

Fig. 1

(b) Differentiate between Phong Shading and Gouraud Shading. Which of the two is better and why? 5

3 (a) Compute the composite 2D transformation matrix when the following transformations are applied in order. (Use homogenous co-ordinates) 5

i. Rotation about origin by 90°
ii. Translation in x-direction by 20 units
iii. Uniform scaling by a factor of 3
iv. Reflection about line y = -x

(b) Specify the rules to equalize the number of vertices in key frames k and k+1 in an animation scene. Use these rules to transform a triangle into a hexagon. 5

4 (a) Consider the position vector: 5

$$[X] = [\,3 \quad 2 \quad 5 \quad 1\,]$$

Find the resultant position vector after applying the given sequence of 3D transformations in order.

i. Translation in x-direction by 2 units
ii. Double the size of cube
iii. Reflect about xy-plane

(b) Derive the basis matrix for Bezier curve. 5

5 (a) Consider an ellipse $\frac{x^2}{8^2} + \frac{y^2}{4^2} = 1$. Scan convert the first quadrant using midpoint ellipse algorithm. 5

(b) Describe the illumination using Phong specular-reflection model. Include the contribution of diffuse, ambient and specular reflection. 5

6 (a) Consider a rectangle PQRS with diagonally opposite corners P (5,5) and R (25,10). Using Cohen and Sutherland Line clipping algorithm, clip the line A (3,4), B (30,15). 5

(b) Differentiate between RGB and CMY color models. Give the transformation matrix required for conversion of RGB color model to CMY color model. Convert the given color with R = 0.24 G = 0.58 B = 0.12 to CMY color mode. 5

7 (a) Briefly explain Z-buffer algorithm for visible surface detection. Give one advantage and one disadvantage of the algorithm. 5

(b) Give combined 4X4 homogenous transformation matrix for the following transformations in sequence given below: 5

i. Rotation about y-axis by +45°
ii. Rotation about x-axis by 30°
iii. Two-point perspective projection on z = 0 plane with center of projection on x-axis at (3, 0, 0) and on y-axis at (0, -4, 0).