UNIT-1 Introduction to Computer Graphics

Q.1 Compare and contrast Raster-Scan System and Random-Scan Systems. 2
Q.2 How does a raster scan system work? How is it different from random scan system? 2
Q.3 Compare Vector (Random) scan displays and Raster scan displays.
Q.4 Write a short notes on Random Scan Systems. 2

Q.5 Explain the construction and working of CRT's and DYST's.
Q.6 Explain the construction and working of Cathode Ray Tubes.

Q.7 Write a short note on DVST (Direct view storage tube) 5

Q.8 Write a short notes on Frame Buffer. 6

Q.9 Write a short notes on Image Digitizer.

Q.10 Define color models and Explain any three color models with diagram.
Q.11 Discuss various colour models used in graphic system. 5 SN 1
Q.12 Write a short notes on HSV Colour Model.
Q.13 Write a short notes on Colour Tables.

Q.14 Write a short note on Graphics System.

Q. What are the steps in animation? Explain.
Q. Write a short notes on Computer Animation. 6
Q. Write a short notes on Animation. 2

Q. Write a short notes on Image Digitization.
Q. Explain in brief the process of digitization.

UNIT-2 Output primitives & its Algorithms

Q.1 Explain the output primitives. 1 SN 1

Q.2 Discuss DDA algorithm for line drawing with an example. 1 SN 1
Q.3 Explain DDA line drawing algorithm and Resterize the line whose end points are A(1,6) and B(9,12) using DDA line drawing algorithm.
Q.4 Rasterize the line whose endpoints are A(-2,5), B(-9,7) using DDA algorithm.
Q.5 Consider the line from (7,8) to (16,18). Use DDA algorithm to rasterize the line.

Q.6 Derive Bresenham's line drawing algorithm. 5
Q.7 Derive and write the Generalized Bresenham's line drawing algorithm.
Q.8 Derive Bresenham's line drawing algorithm. Rasterise a line A=(3,6), B=(9,14) using the same.
Q.9 Derive Bresenham's line drawing algorithm. Rasterise a line A=(3,6), B=(9,11) using the same.
Q.10 Use Bresenham's line drawing algorithm to rasterize the line P1-P2 with endpoints P1(10,10), P2(20,16).
Q.11 Write the Bresenham's line drawing algorithm and rasterize the line between the endpoints (4,7) and (9,11)

Q.12 Explain the algorithm for drawing a circle using midpoint approach.
Q.13 Deduce the mid-point Circle algorithm. 2
Q.14 Derive midpoint circle algorithm and use it to rasterize a circle centered at origin with radius 10.
Q.15 Write an algorithm for a midpoint circle generation. And Plot a circle centered at (10, 5) having a radius of 15 units.
Q.16 Plot a circle centered at (10, 4) having a radius of 8 units using midpoint circle algorithm.
Q.17 Plot a circle centered at (15, 10) having a radius of 7 units using midpoint circle algorithm.

Q.18 Explain with algorithm Bresenham's circle drawing algorithm. 2
Q.19 Rasterize the circle having r=10 in first quadrant.

Q.20 Explain the algorithm for drawing an ellipse.
Q.21 Rasterize the ellipse having r_x=8 and r_y=6 in first quadrant. 2
Q.22 Rasterise the ellipse having rx=3 and ry=6 and center located at (15,-20).

Q.23 Deduce the mid-point Ellipse algorithm. 2

Q.24 Compare and contrast B-Spline (BSP) and Bezier curves. 4
Q.25 Write the properties of B-Spline curves. How are they different from Bezier curves? 2
Q.26 Discuss the typical characteristics of Bezier Curves and B-Spline Curves along with their applications.
Q.27 Write a short note on Cubic Bezier Curve.
Q.28 What are the properties of the curve? 2 Derive quadratic and cubic Bezier curve.
Q.29 What are the properties of the curve and Give the derivation of Cubic Bezier curve.
Q.30 What are the properties of the curve? Give the derivation for Bezier curve.

Q.31 Construct the Bezier curve of order 3 with 4 polygon vertices A(1,1) B(2,3) ,C(4,3), D(3,1).
Q.32 Construct the Bezier curve of order 3 with 4 polygon vertices A(1,1) B(2,3) ,C(4,3), D(6,4). 5
Q.33 Construct the Bezier curve of order 3 with 4 polygon vertices A(1,1) B(2,3) ,C(4,3), D(3,1). Generate at least 3 points on the curve.

Q.34 Compare Boundary fill and Flood fill algorithm, Write a procedure to fill region bounded by different color used 4 or 8 connected approach. 2
Q.35 Compare and contrast between flood fill and boundary fill algorithm used for region filling. 2
Q.36 Explain the boundary fill algorithm to fill closed regions. List its advantages and disadvantages.
Q.37 Write a short notes on Flood fill algorithm.
Q.38 Write a short notes on Boundry fill algorithm.
Q.39 Write the procedure for 8 connected flood-fill.
Q.40 How region filling algorithm are developed for polygons and curved boundary objects?

Q.41 Derive the Scan-line polygon filling algorithm. 3

Q.42 Write a short note on Inside Outside test. 4
Q.43 Write a short note on Even-Odd Method.
Q.44 Write a short note on Winding number rule test. 2
Q.45 Write a short note on Non-Zero winding number rule.

UNIT-3 2D Geometric Transformations & Clipping

Q.1 Discuss the implementations issues of Sutherland Hodgeman and polygon clipping Algorithm.

Q.2 Write Sutherland Hodgeman algorithm for polygon clipping. 2 SN 1

Q.3 Explain with example Cohen Sutherland technique for line clipping. 6

Q.4 Use Cohen Sutherland algorithm to clip two lines P1(40, 15) – P2(75, 45) and P3(70, 20) – P4(100,10) against a window A(50, 10), B(80, 10), C(80,40) and D(50, 40).

Q.5 Which of the given lines would be visible, rejected and/or clipped when Cohen Sutherland line clipping algorithm is applied in a window whose Lower left of window is (10,10) and upper right is (20,20).
Find the new co-ordinates of clipped lines if any…
Lines: AB(12,18)-(16,12), CD(13,15)-(25,15), EF(12,4)-(25,8), GH(8,13)-(13,24) and IJ(5,25)-(25,25).

Q.6 Clip the lines AB and GH against the window lower left (-3,1) and upper right (2,6) using Cohen Sutherland algorithm. (Lines end points A(-4,2) B(-1,7) G(1,-2) H(3,3))

Q.7 Given a clipping window - A(20,20) B(60,20) C(60,40) D(20,40). Using Sutherland Cohen algorithm find the visible portion of line segment joining the points P1(40,80) P2(120,30).

Q.8 Clip the following lines using the Cohen Sutherland algorithm:-

a) A=(50,200), B=(220,60)
b) C=(270,80), D=(270,330)
c) E=(200,200), F=(330,200)
d) G=(170,220), H=(220,370)

The co-ordinates of the upper left corner and the lower right corner are X=(100,100) and Y=(300,300) respectively. 2

Q.9 Explain the Midpoint Subdivision Algorithm. Prove that it works successfully with lines that are partially inside and partially outside the viewing window. 2

Q.10 Explain with an example the mid-point subdivision line clipping algorithm.

Q.11 Explain the Midpoint Subdivision Algorithm with an example, Also list its advantages and disadvantages.

Q.12 A clipping window ABCD is specified as- A(0,0), B(50,0), C(50,50), D(0,50), Using midpoint subdivision algorithm find the visible portion, If any, of the line segment joining the points P(-10,20) and Q(70,10).

Q.13 Write an algorithm for Liang Barsky line clipping algorithm. 3

Q.14 Use Liang – Barsky line clipping algorithm to find the visible portion of the line P1(-10,50) to P2(30,80) against window (X_{wmin}=-3, Y_{wmin}=10) (X_{wmax}=20, Y_{wmax}=60).

Q.15 Derive the Liang Barsky's line clipping algorithm and use it to clip a line P1-P2 with P1(-75,-100), P2(175,50) against the window with (X_{wmin}, Y_{wmin})=(0,0) and (X_{wmax}, Y_{wmax})=(150,100)

Q.16 Find the clipping coordinates for line P1,P2 whare P1(-1,7), P2(11,1) against the window with (X_{wmin}, Y_{wmin})=(1,2) and (X_{wmax}, Y_{wmax})=(9,8) using Liang Barsky's algorithm. 3

Q.17 What is viewing pipeline? 2 Explain the blocks of viewing pipeline. 1SN1

Q.18 Define window and viewport. Derive the window to viewport transformation. 2

Q.19 Describe Window to viewport transformation with diagram. 2 SN 1

Q.20 What is 2D viewing transformation. Derive the window to viewport transformation equation. 3

Q.21 Explain window to view port mapping.
Find a normalization transformation from the window whose lower left corner is at (1,1) and upper right corner is at (3,5) onto

a) A viewport that is the entire normalized device screen.
b) A viewport that has lower left corner at (0,0) and upper right corner at (1/2,1/2). 4

Q.22 Describe any three 2 dimensional transformation methods.
Q.23 Define the different types of 2D transformations with matrix representations.
Q.24 Derive 2-D Rotational transformation matrix.
Q.25 Write a short notes on 2D Rotation.

Q.26 Write a short notes on homogeneous coordinates.
Q.27 What are homogeneous coordinates? Explain its significance with examples. 1 SN 1
Q.28 Give a 3*3 homogeneous coordinate transformation matrix for each of the following translations.

a) Shift the image to the right by 3 units.
b) Shift the image up by 2 units.
c) Move the image down by ½ unit and right by 1 unit.
d) Move the image down by 2/3 unit and left by 4 units.

Q.29 Find the transformation matrix that transform the given square ABCD to half its size with center still remaining at the same position. The coordinates of the square are A(1,1), B(3,1), C(3,3), D(1,3) and center at (2,2), Also find the resultant coordinates of the square.
Q.30 Find the transformation matrix that transform the given square ABCD to half its size with center still remaining at the same position. The coordinates of the square are A(10,10), B(30,10), C(30,30), D(10,30) and center at (20,20), Also find the resultant coordinates of the square.

Q.31 Explain homogeneous coordinates and scale the polygon with coordinates A(2,5), B(7,10) and C(10,2) by three units in x direction and two units in y direction.
Q.32 Consider the effect of translation in the x, y, z direction by -2, -2, -2 resp. followed successively by a 45 deg. Rotation about y-axis and 60 deg. Rotation about x-axis on the homogeneous coordinate [3 2 11]

Q.33 Explain shearing transformation and Reflection transformation.
Q.34 Write a short notes on Shear transformation. 3
Q.35 Apply the shearing transformation to square with A(0,0), B(1,0), C(1,1), D(0,1) as given below:- 2

a) Shear parameter value of 0.5 relative to the line Y_{ref}=-1
b) Shear parameter value of 0.5 relative to the line X_{ref}=-1

Q.36 Write a short notes on Composite Transformation
Q.37 Write a short notes on 2D rotation about arbitrary point.
Q.38 Discuss the process of rotating an object about an arbitrary axis.
Q.39 Discuss the process of rotating an object about an arbitrary point (xp,yp).

Q.40 Write a short notes on Inverse Transformation 3

Q. Device a procedure to rotate a rectangle by n degrees in clockwise direction and reduce to 2/3rd of its size by keeping the midpoint fixed.

Q. Find out the final co-ordinates of a figure bounded by the co-ordinates (1,1),(3,4),(5,7),(10,3) when rotated about a point (8,8) by 30 degree in clockwise direction and scaled by two units in x-direction and three units in y-direction. 3

Q. Derive 2D rotation and scaling transformation matrices with respect to fixed point (Xp,Yp). 3
Q. Explain the concept of fixed point scaling of a triangle with a diagram.
Q. Apply the scaling transformation on triangle A(10,10), B(17,8) and C(13,15) by keeping C fixed.

Q. A rectangle has lower left corner at (20,20), and upper right corner at (60,40)
Perform the following transformations one after another on the rectangle and obtain its coordinates after every transformation.

1) Rotation by 90 degrees in anticlockwise direction, about its center
2) Scale the rectangle about origin so that it reduces to half of its size
3) Reflection in Y axis.

Q. Consider the object with co-ordinates A(2,4), B(3,1), C(5,3). Transform it by first reflecting it about x-axis and then rotating it by 60 deg.

Q. Explain the process of reflecting an object across an arbitrary line y=mx+c.
Q. Describe the transformation ML which reflects an object about a line y= mx+b
Q. Find the final transformation matrix, when point P(x,y) is to be reflected about a line Y=mx+c.
Q. A rectangle ABCD is reflected across the origin and then reduced to half its size by keeping a point P=(15,15) fixed. Calculate the new transformed co-ordinates. What would happen in case the sequence of the above transformation is reversed. The coordinates of the rectangle are A(10,10), B(30,10), C(30,30), D(10,30).

Q. Reflect the triangle ABC about the line 3x-4y+8=0. The position vector of the coordinate ABC is given as A(4,1), B(5,2) and C(4,3).
Q. Consider the triangle ABC whose coordinates are A=[4,1], B=[5,2] and C=[4,3]. In each case find the coordinates of reflected triangle.

a) Reflect the given triangle about X-axis.
b) Reflect the given triangle about Y-axis.
c) Reflect the given triangle about Y=X.
d) Reflect the given triangle about Y=.X.

Q. Write the metrics for following transformations

i. Rotation about a pivot point
ii. Scaling wrt a fix point
iii. Translation
iv. X-Y shear
v. Reflection about X axis
vi. Reflation about line 1
vii. Translation matrix

Q. Write a short notes on Diffuse Illumination. 3
Q. Write a short notes on Text Clipping.
Q. Find out the dynamic range of an image if all the slopes in the contrast stretched algorithm l, m, n are given as 0.2, 0.5, 0.2 respectively. The initial dynamic range of the original image is [0 - 10], a=4 and b=8.

UNIT-4 Basic 3D Concepts & Fractals

Q.1 Explain 3 dimensional Translation, Rotation and Scaling transformations.
Q.2 Give 3D transformation matrices for translation, scaling and rotation.
Q.3 Write the meaning and matrix representation of 3D transformations – translation, rotation, scaling, reflection and shear.

Q.4 Derive a single matrix which when applied to an image, will perform the following transformations at once in three dimentional space:-

a) Rotate by 30 degree around X and Y axis.
b) Scale by 3 units in X axis and 4 units in Z axis.

Q.5 Compare and contrast Parallel and perspective projections. 4
Q.6 What are projections? Explain various types of projections. 6
Q.7 What are projections? How are they useful? Explain different types of projections with examples. 3
Q.8 Discuss types of Projections in Computer graphics with suitable examples.
Q.9 How is a parallel projection taken? What are its different types? How is it different from perspective projection?
Q.10 Write a short notes on Perspective projection.
Q.11 Explain Parallel Projection. Also derive the parallel projection matrix.

Q.12 Derive Perspective Projection Transformation of any point p(x,y,z) on to the xy plane with center of projection cop (x_p, y_p, z_p)

Q.13 Explain Halftone shading technique and compare this with Dithering technique.
Q.14 Explain in detail Halftoning and Dithering techniques. 3
Q.15 Differentiate between halftone and Dithering techniques. 2
Q.16 Explain Halftone shading technique. 1 SN 1

Q.17 What is fractal? What are different types of fractals? How is a fractal dimension measured? 3 SN 1
Q.18 Define Fractals? List and explain the different types of Fractals. 4
Q.19 What are fractals? How to determine the fractal dimension and write the fractal generation procedure for Koch curve?
Q.20 Explain the Kotch curve in brief. 1SN2

Q.21 What are Octress? How can they be used to represent Three-Dimensional Objects.

Q. Derive a single 4 X 4 matrix for the following transformation 2

I. Rotate by 180 around y axis
II. Translate by 3 units in x axis and 4 units in z axis
III. Scale by 4 units in y axis

Q. Explain the reflection about arbitrary axis in 3D with matrices.

UNIT-5 Introduction to Image Processing

Q.1 What are the fundamental steps in Digital Image Processing? Explain in brief. 2

Q.2 Explain the basic components of a digital image processing system.

Q.3 How is image sampling and quantization done, Explain in details.
Q.4 Write a short notes on Sampling & Quantization

UNIT-6 Image Enhancement Techniques

Q.1 What is histogram? Explain the technique of histogram equalization for enhancing an image.

Q.2 Perform Histogram Equalization on the given image and draw the original as well as Equalized Histogram.

Gray Level	0	1	2	3
No. of pixel	70	20	7	3

Q.3 Equalize the following histogram and draw the original and equalized histogram.

Intensity	0	1	2	3	4	5	6	7
No. of Pixels	15	28	5	7	24	5	6	10

Q.4 Equalize the following histogram. 2

Gray Level	0	1	2	3	4	5	6	7
No. of Pixels	790	1023	850	656	329	245	122	81

Q.5 Equalize the following histogram.

Gray Level	0	1	2	3	4	5	6	7
No. of Pixels	50	0	50	0	50	0	50	0

Q.6 Discuss any two spatial domain filter approaches for image enhancement. 2
Q.7 Explain in brief the process of Bit Plane Slicing. 2
Q.8 Write a short notes on Image averaging.
Q.9 Write a short notes on Image Substration.

Q.10 Apply the following transformation on the following 3BPP image

1) **Image Negative**
2) **Gray-level slicing with background range of interest (r1=3,r2=5)**
3) **Thresholding with threshold value=4**

3	0	6	3	7	6
1	7	1	3	0	7
7	3	3	5	0	2
5	3	0	5	6	2
6	1	2	1	4	2

Q.11 Apply the following transformation on the following 3BPP image

1) **Image Negative**
2) **Gray-level slicing with background range of interest (r1=3,r2=6)**
3) **Thresholding with threshold value=4**

2	1	0	7	5
4	2	3	1	2
7	6	2	1	6
2	4	5	6	7
2	3	4	5	1

Q.12 Compare and contrast median and averaging filter.
Q.13 Explain in brief averaging filter and median filter.

Q.14 For the following 4 bit image perform the following operations.
Threshold T=8
Intensity level slicing with background a=6 and b=12

Median filtering only at center location remaining value no change negation

$$F = \begin{matrix} 2 & 13 & 4 \\ 15 & 6 & 12 \\ 0 & 9 & 3 \end{matrix}$$

Q. Derive the sharpening second order derivative Laplacian mask in image enchancement.

Extra Questions

Q. Explain and write the Z-Buffer Algorithm along with its advantage and disadvantages. 4
Q. What is visible surface detection? Differentiated between Z-buffer A-buffer algorithms of visible surface detection.
Q. What do you mean by hidden surface removal?
Q. Explain Z-Buffer algorithm for Hidden Surface Removal. 3
Q. Explain the Z-Buffer algorithm for hidden surface removal and compare it with A-buffer algorithm.
Q. What is visible surface detection? Differentiated between the object space method and image space method of detecting visible surface. Explain the Depth buffer method for visible surface detection.
Q. Explain any two methods for visible surface detection. 2
Q. What do you mean by the visible surface detection? Explain any one image space algorithm.
Q. What is visible surface detection? Explain the Z-Buffer Algorithm for visible surface along with an example.

Q. Prove: Two successive Rotations are additive, Two successive scaling are multiplicative.

Q. Discuss in brief Phong Shading. 2 SN 2
Q. Describe Phong shading technique with the help of a diagram.
Q. Write a short notes on Constant intensity shading.

Q. Explain the relevance of normalized device coordinates.

Q. Discuss different ways of motion specification.

Q. Explain different methods of character generation. 1 SN 2

Q. Write a short notes on

a. **Morphing 2**
b. **Kinematics and Dynamics**
c. **Ray Tracing 2**
d. **Display File interpreter**
e. **Antialiasing**

Papers are Use

CG May-17 cbgs	CG Dec-16 cbgs	CG June-16 cbgs	CG Dec-15 cbgs	CG June-14 cbgs
CG June-17 old	CG June-14 old	CG Nov-11	CG Dec-10	CG May-10
CG May-18 IDOL	CG Dec-17 IDOL	CG May-16 IDOL	CG OCT-16 IDOL	CG April-15 IDOL
CG May-15 CBGS	CG Dec-14 cbgs	CG Dec-13 cbsgs	CG cb	