TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEI	Pass Marks	32
Year / Part	II / II	Time	3 hrs.

Subject: - Computer Graphics (*EX 554*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is refresh rate? Calculate the size of frame buffer in KB needed to represent the screen of size 4 inch × 5 inch whose resolution is 128 dpi and uses the 8-bit true color. [4]
2. Devise Bresenham's decision parameter for a straight line with negative slope with $|m| < 1$, applying right to left sampling. Assume that the line lies in the second quadrant. [10]
3. Derive the transformation matrix to reflect the object from line $y = mx + c$. [5]
4. Define window to view port transformation. Clip the line RS, R (2, 4) and S (8, 7) against the window WXYZ, W(3, 3), X(3, 6), Y(7, 6), and Z(7, 3) using Cohen Sutherland algorithms. [5]
5. Describe 3-D viewing pipeline. Obtain the perspective projection matrix for the projection reference point lies on the negative Z-axis. [5+5]
6. What is the importance of parametric cubic curve in graphical modeling? Derive the relation of blending function of Hermite curve using interpolation. [5]
7. Given a Bezier curve with 4 control points A(1, 0), B(3, 3), C(6, 3), D(8, 1). Determine any 5 points lying on the curve. Also draw a rough sketch of the curve. [5]
8. Compare object space method and image space method. Describe the back face detection method with necessary figures and apply this algorithm to find the visibility of a triangular object defined by coordinates (2, 0, 0), (0, 2, 0), (0, 0, 2) when viewed from point (4, 4, 4). [2+4+4]
9. Classify the different types of visible surface detection techniques. Explain about back face detection method for visible surface detection. [5]
10. List the disadvantage of depth buffer method. Explain how scan line method detects the visible surface with example. [5]
11. Write a general illumination model with multiple light sources and explain each term with necessary figures. What is the attenuation factor and how does it affect the intensity calculation? [6]
12. Briefly explain Gouraud shading and Phong shading algorithms with necessary derivations and figures and compare these algorithms. [6]
13. Define callback function. Demonstrate how a polygon can be created using OpenGL. [4]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Computer Graphics (*EX 603*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What are the differences between random and raster display technologies? When do we prefer them? [6]
2. Write an algorithm for Brescnham's method of line drawing. Digitize a line with end points (10, 20) and (15, 2) using this algorithm. [5+5]
3. Find the composite transformation matrix for reflection about a line y = mx +c. [8]
4. Describe polygon, Vertex and Edge table. How these terms can be used to construct a model of Dharahara. [2+2+2+2]
5. What do you underatand by affine transformation? Derive expressions for oblique projectiman paralle projection. [2+4+4]
6. What is a Bezier Curve? Find the coordinates of Benzier curve at u = 0.25, 0.5 and 0.75 with respect to the control points (10, 15), (15,20), (20, 35), (25, 10) using Bezier function. [1+5]
7. How back-face detectium method is used to detect visible surfaces? What are it's limitation? Purpose an approach to overcome it's limitations. [4+2+4]
8. Derive an expression for phong illumination model for light sources. [8]
9. Find out the total intensity at the centroid of a triangle defind by A(2,1,1), B(0,1,1), C(0,0,1), when illuminated by a point light source of intensity IL = 0.6 at (2,2,6) using illumination model. The viewer is at (2,3,6). Assume ambient Intensity Ia = 0.1 and parameters: ka = 0.5, kd = 0.8, ks = 0.7, take n = 10. [8]

   [centroid: (x1 + x2 +x3)/3, (y1+y2+y3)/3, (z1+z2+z3)/3]
10. What is open GL? How can we use lighting in open GL? [2+4]

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TRIBHUVAN UNIVERSITY
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Examination Control Division
2078 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEI	Pass Marks	32
Year / Part	II / II	Time	3 hrs.

Subject: - Computer Graphics (*EX 554*)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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1. What is pixel and pixel depth? Let the resolution of screen is 1024 × 512. What is the memory captured by the frame buffer that uses primary color for display? [2+3]
2. Derive the p-value for midpoint circle algorithms scanning towards anti clockwise direction starting from (r,0). [7]
3. Compare and contrast between Digital Differential Analyzer line drawing algorithm and Bresenham's Line drawing algorithm. [3]
4. Scale the triangle with vertices A (1,1), B (4,4) and C (2,3) to double along horizontal direction and triple of vertical direction about point (2,3). [6]
5. Use Cohen Sutherland clipping Method to clip a line starting from A (-1,5) and ending at B(3,8) against the window having its lower corner at (-3,1) and upper right corner at (2,6). [4]
6. Why we need projection in computer graphics? How can you reflect an object about an arbitrary axis in 3D? Explain each step in detail. [8]
7. Define Hermite curve. Write the equation of Bezier curve with four control points p_1 (2,2,0), p_2 (2,3,0), p_3 (3,3,0), and p_4 (3,2,0). Find the coordinate pixel of the curve for u = 0, 1/4, 1/2, 3/4 and also plot the curve on graph. [8]
8. Differentiate boundary representation and space partitioning representation of polygon surface. If three vertices of a polygon surfaces in anticlockwise direction are V1 (1,0,0), V2 (1,1,0) and V3 (1,0,1). Calculate normal vector of that surface. [4+4]
9. How Scan Line Method is used for visible surface Detection? Explain in detail. [8]
10. Define Illumination and surface rendering. Explain basic illumination model. [2+6]
11. Explain Gouraud shading method with its advantages and disadvantages. [8]
12. Explain the importance of open GL. Write a program to display Red Rectangle in open GL. [7]

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2078 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Computer Graphics *(EX 603)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. What is computer graphics? Calculate the total memory required to store a 10 minute video in a SVGA system with 24 bit true color and 60 fps refresh rate. [2+4]
2. Write an algorithm for drawing a circle. Using midpoint circle drawing algorithm, calculate the coordinates on the first quadrant of a circle having radius 8 and centre (10, 10). [4+6]
3. It is necessary to construct curves using parameteric equations? Justify. List down the steps for modeling curves using splines. [4+4]
4. Reflected the triangle ABC about the line $3X - 4Y + 8 = 0$. The position vector of the coordinate ABC is given A(4, 1), B(5, 2) and C(4, 3). [8]
5. Describe 3D viewing pipeline. Derive complete world-to-viewing coordinate transformation matrix. [3+7]
6. Why do we use geometric tables and attribute tables for defining a polygon surface? How do you calculate the spatial orientation of a polygon? [3+3]
7. What is the limitation of Z-buffer method? How does A-buffer method overcome it, explain? [3+7]
8. Derive the expression to calculate the total light intensity in a point. [8]
9. Compare and contrast between Gouraud and Phong shading model. [8]
10. What is OpenGL? How can we draw colored line and polygon using OpenGL? [2+4]

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