Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Spring

Year : 2013
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) What are components that computer graphics consists of? Explain them with diagram. 8
   b) On an average it takes 200 nano second to access a pixel value from the frame buffer and glow a phosphor dot on the screen for a Raster System. If total resolution of the screen is 1024 x 1024, will this access rate create a flickering effect on the screen? Illustrate 7
2. a) Explain the architecture of raster display with a neat block diagram. 8
   b) While scan converting an ellipse, how do we know that we have reached the second region of the first quadrant of the Ellipse? Explain with a expressions. 7
3. a) Digitize a line with end points A(2,10) and B(5,18) using Bresenham's Line drawing algorithm. 8
   b) Differentiate between window port and view port. Derive the transformation matrix for window to view port transformation. 7
4. a) What is the significance of Clipping operation? Explain the Clipping operation used for clipping lines in 2D. 8
   b) Scale a triangle A(0,0), B(1,1), C(3,2) by twice its original size, about origin and about point P(-1,-2). 7
5. a) What do you mean by projection? Differentiate between parallel and perspective projection with example. 8
   b) What do you mean by surface rendering? Explain Phong Shading method for surface rendering. 7
6. a) What do you mean by hidden surface removal? Discuss Scan Line method for removing hidden surfaces. 8
   b) What are the steps to be followed for project development? What is significance of making plans for a project? 7

7. Write short notes on: *(Any two)*
   a) Light Pen
   b) Cohen-Sutherland Line Clipping
   c) Bezier Curves.

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Fall

Year : 2014
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Discuss the concept of the computer graphics in IT field. 5
   b) Explain the need of GKS. 5
   c) Explain the need for machine independent Graphical Language. 5
2. a) Compare raster scan display system with vector scan display system along with their architectures. 8
   b) What is flat panel display? Explain the working principles of LCD monitor with figure 2+5
3. a) Rasterize the circle of 10 unit radius 8
   b) Explain boundary fill technique with its algorithm. 7

OR

Derive equations for Bresenham's line drawing algorithm for line with slope $|m| > 1$. 7

4. a) Perform a 45 degree rotation of a line A (5,3) and B (10,15) about the origin. 8

OR

Calculate viewing transformation matrix with given information: given triangle with sides A(5,5) B(15,5) C(10,10), given window coordinate (7,4)(13,4)(13,8),(7,8) and view port location is (17,7)(18,7)(18,8)(17,8)? 8

   b) What is clipping? Explain in detail about Sutherland-Hodgeman polygon clipping algorithm. 7
5. a) Derive a transformation matrix due to orthographic and oblique parallel projection. 8
   b) Derive an matrix for cubic Bezier curve formation. 7
6. a) Compare object space method with image space method Explain scan 4+4

line algorithm for detecting visible surfaces with suitable figure
   b) Explain the Constant Gouraud and Phong shading models
7. Write short notes on: **(Any two)**
   a) Scan line method
   b) A- Buffer algorithm
   c) Project development

POKHARA UNIVERSITY

evel: Bachelor
rogramme: BE
ourse: Computer Graphics

Semester: Fall

Year : 2015
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

Give your opinion on why interactive graphics has been able to gain such an immense amount of popularity in diversified fields like business, engineering, medicine etc. 7

In case of two raster systems with resolutions of 640 by 480 and 1024 by 600, how many pixels could be accessed per second in each of these systems by a display controller that refreshes the screen at a rate of 75 frames per second? What is the access time per pixel in each system? 8

Differentiate between Random scan display and Raster scan display. 8

What is DDA? Derive the Bresenham's line drawing algorithm for the slope greater than one. 7

) Find the raster position along the region 1 of the ellipse path in first quadrant. The semi major and semi minor axes are 8 & 7 respectively and the center is (0, 0). 7

) Explain Sutherland-Hodgeman ploygon cliping algorithm with example. 8

a) Define window and view port? Derive the matrix that is responsible for placing an object from a window to viewport. 7

b) Derive the expression and matrix representation for perspective projection. 8

a) Why is it required to take care of issues like removal of hidden surfaces in 3D viewing? Differentiate between A Buffer and Depth Sorting Approach for detecting visible surfaces in 3D? 7

b) Differentiate between 2-D and 3-D graphics? In graphics which dimensional is more applicant. 8

6. a) Define lighting model and ambient light Differentiate phong Shading and gouraud Shading method. 7

   b) How does the Gouraud Shading algorithm interpolate intensities at different points of a polygon surface to give a smooth shading effect? What are its drawbacks? 8

7. Write short notes on: **(Any two)** 2×5

   a) Color models and its types.

   b) Back face detection.

   c) Fractal geomectry method.

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Spring

Year : 2015
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Why do you think that the use of computer graphics is growing? Explain with suitable examples from various fields. 8
   b) Explain the working principle of shadow mask method with a diagram. 7
2. a) How colors are displayed in monitor? Explain. 7
   b) Explain the logic used for drawing lines with positive and negative slopes using Bresenham's Line drawing algorithm? 8
3. a) Digitize a circle centered at (100,200) and having radius 8. 7
   b) What will be the final coordinates of a triangle with vertices A(2,3) B(3,3) C(3,2) after rotating it a by 45 degrees in anticlockwise direction then shifting it down by 3 units and finally enlarging it by twice its original size? 8
4. a) What is line clipping? Explain the Cohen Sutherland line clipping algorithm. 8
   b) What role does vanishing point play in perspective projection? Explain by deriving equations for Perspective Projection by considering a vanishing point. 7
5. a) What is the significance of Homogenous Coordinate System? How can an object be reflected about an arbitrary plane in 3D? 8
   b) At what time which color models (RGB and CMYK) is important. Explain. 7
6. a) How do the ISM approaches differ from OSM approaches for detecting visible surfaces in 3D? Differentiate between Area Subdivision Method and Depth Sorting Approach for detecting visible surfaces in 3D? 8

   b) Explain the APIs used in OpenGL for rendering Graphical objects
7. Write short notes on: (**Any two**)
   a) Open GL
   b) Flood fill techniques
   c) Input and Output Devices

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Spring

Year : 2016
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

Computer graphics has enhanced the quality of work in many areas. Support this statement through a brief discussion on areas of application of computer graphics. Specify at least one specific application. 7

Define resolution and image aspect ratio. A laser printer is capable of printing two Pages (size 9x11 inch) per second at resolution of 600 pixels per inch. How many bits per second does such device required? (Assume 1 pixel = n bits)? 8

What is Emmissive display and explain any one with example? What are the advantage and disadvantage of LCD display? 7

Derive Bresenham's Line drawing algorithm for slope less than one. How can this line (with end points $A(x_1,y_1)$ $B(x_2,y_2)$ and slope less than 1) be drawn if the starting point is taken as $B(x_2,y_2)$? 8

What will be the final coordinates of a polygon with vertices A(3,4) B(5,4) C(5,2) D(3,4) after it is reflected about a line $y = 2x - 1$? 8

Define boundary fill technique? Differentiate between Bresenham's line and DDA line drawing algorithm. 7

Explain the steps of 2-D viewing pipeline? How is the complexity added in 3-D viewing process in compare to 2-D viewing process? 7

Why do we need clipping? Explain Cohen-Sutherland Line Clipping algorithm. 8

What do you mean by perspective projection? Derive an expression for finding perspective projection of a point onto a plain surface. 7

Differentiate between RGB color model and CMY color model? 8

Explain any two graphical file formats.

6 a) What is Gouraud shading? Explain it with an example. What are its drawbacks? 7

b) Giving the computation of depth value, explain the depth buffer algorithm for detecting visible surfaces. What is its drawback? How is it removed? 8

7. Write short notes on: (Any two) 2×5

a) Perspective Projection

b) openGL

c) Homogenous coordinate

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Fall

Year : 2016
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) "A picture speaks thousands of words". Explain with reasons as to why this statement is true emphasizing the popularity that the field computer graphics has gained in diversified fields. 7

   b) Consider two raster systems with resolution of 640 by 480 and 1280 by 1024. How many pixels could be accessed per second in each of these systems by a display controller that refreshes the screen at a rate of 60 frames per second? What is the access time per pixel in each system? 8

2. a) What is an Input device? Explain. Describe the working principle of a touch panel. 7

   b) Use Liang Barsky line clipping algorithm to clip a line starting from (-11, 5) and ending at (15, 11) against the window having its lower left corner at (-6,-4) and upper right corner at (10, 8). 8

3. a) How does the scan line polygon fill approach differ from flood fill approach for filling graphical images? Explain with practical examples of each of them. 7

   b) A point (5, 3) is required to be rotated by 45 degrees in clockwise direction and then scaled by a factor of 3, what will be the final transformed position after applying these transformations. 8

4. a) Discuss why homogeneous coordinates are used in Computer Graphics for transformation computations? Also explain homogeneous transformation matrix for various 2D basic transformations. 8

   b) Describe different types of parallel projections. Derive the transformation matrix for parallel projection. 7

5. a) Differentiate between Image Space Method and Object Space Method? Also write down the Painter's algorithm. 7

   b) Write the Z-buffer algorithm for detecting visible surface with its drawback and remedy. 8

6. a) Explain the expression used for calculating the intensity of light incident on a surface due to Specular reflection? How is intensity interpolated in case of Goroud Shading? 8

   b) Why is OpenGL considered to be cross language and cross platform collection of application programming interfaces for rendering objects? Explain any four OpenGL APIs that you are familiar with. 7

7. Write short notes on: (**Any two**) 2×5

   a) Mach Bands

   b) Orthographic Parallel Projection

   c) Color Models

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Spring

Year : 2017
Full Marks: 100
Pass Marks: 45
Time : 3hrs

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

a) Compare and contrast raster scan display and vector scan display architecture. 7

b) Define Display controller? What are the major application areas of computer graphics? 8

a) Define resolution. Suppose RGB raster system to be designed using on 8 inch x 10 inch screen with a resolution of 100 pixels per inch in each direction. If we want to store 6 bits per pixel in the frame buffer, how much storage (in bytes) do we need for frame buffer? 8

b) Digitize one octant of a circle by using midpoint circle generation algorithm center at origin and radius is 12. 7

a) Derive an equation for drawing a line using Bresenhams's algorithm for slope less than one. 8

b) Explain two dimensional line clipping algorithm with suitable example. 7

a) Differentiate between windows and viewport? Explain the steps of viewing transformation. 7

OR

A mirror is placed vertically such that it passes through the points (10,0) and(0,10). Find the reflected view of triangle ABC with coordinates A(5,50), B(20,40) and C(10,70).

b) Describe the rotation of an object about an axis, which is parallel to any of three coordinate axes of coordinate system. 8

a) Explain the back face detection method with an example. 8

b) What is ambient light? Compare diffuse reflection with Specular reflection. 7

a) Explain Fast Phong shading algorithm in detail with necessary equations and figures. 7

b) Why machine independent programming language is used? Discuss about OPENGL. 8

Write short notes on: (**Any two**) 2×5

a) 2D rotation
b) Graphics file format
c) RGB color model

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Fall

Year : 2017
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What do you understand by computer graphics? Mention some of the advantages of computer graphics. 2+5
   b) Explain the working principal of LCD and LED. 4+4
2. a) Explain the techniques of pixel considered as connected? Write logic to draw a circle using midpoint circle algorithm. 3+5
   b) Using the Bresenham's line drawing algorithm predict the pixels on the line from (2,2) to (12,10) 7
3. a) Show that the composition of two successive rotation are additive. 5
   b) Derive the composite transformation matrix for reflection of an object about a line Y=mx+c. Apply the derived matrix for the object A (4,2) B(7,3) C(9,2) D(10,1) on to the line y=3x. 10
4. a) What are the issue in 3D that makes it more complex than 2D? Derive an equation for 3D translation and reflection. 3+4
   b) Define Projection. Difference between parallel and perspective projection along with an equation. 2+6
5. a) Compare object space method with image space method. Explain scan line algorithm for detecting visible surfaces with suitable figure. 4+4
   b) What is Specular reflection? Explain the total intensity due to Specular reflection. 2+5
6. a) Explain Gouraud Shading and Phong Shading technique in detail with their advantage and disadvantage. 4+4
   b) Define Graphics file format. Explain with example, the need for machine Independent Graphical Language. 2+5
7. Write short notes on: **(Any two)** 2×5
   a) Frame Buffer Organization
   b) Beizer Curve
   c) Depth Buffer method
   d) Cohen-Sutherland

POKHARA UNIVERSITY

Semester: Fall

Level: Bachelor
Programme: BE
Course: Computer Graphics

Year : 2018
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) Differentiate between raster and random scan system with their corresponding architectures. 7
   b) Define resolution and persistence. How long would it take to load a 640×480 frame buffer with 12 bits per pixel, if 10^5 bits can be transferred per second? How long would it to load 24 bits per pixel frame buffer with a resolution of 1280×1024 with using the same transfer rate? 8
2. a) How decision parameter is calculated in Mid point circle method. Show all necessary derivation. 7
   b) Explain boundary fill and flood fill algorithm in detail. 8
3. a) What will be the final coordinates of a triangle with vertices A(2,3) B(3,3) C(3,2) after reflecting it about the line y = x? 8
   b) What do you mean my windowing and Clipping? Explain window to viewport transformation pipeline. 7
4. a) Show how to use a 3 Dimensional matrix to rotate a unit cube about the axis defined by vector (1,1,1). 8
   b) Explain Bezier method of curve drawing. 7
5. a) Define the terms: depth cueing and surface rendering. Write down the necessary algorithms for any one of the image space method. 8
   b) How phong shading is different from Gouraud shading? Explain it. 7
6. a) Obtain a illumination equation due to ambient, diffused and specular reflection model at a point. 8
   b) Explain the need for machine independent graphical languages. And also explain about GKS. 7
7. Write short notes on: **(Any two)** 2×5
   a) Application areas of computer graphics
   b) Working principle of LED
   c) Composite transformations

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Spring

Year : 2018
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain frame buffer? How is computer graphics applicable in the field of GUI, Entertainment and medical science? Explain 5
   b) Calculate the access time for a pixel and a row for a graphics system having resolution of 1024*640 and frequency of 60 Hz. 5
   c) Explain raster scan system with video controller. 5
2. a) How colors are displayed in monitor? 5
   b) Explain in steps the Z-buffer algorithm. 5
   c) Explain scan Line Method. 5
3. a) Derive an equation for calculating points of an ellipse. 7
   b) Rasterize the points of given line end points A(-2 , -4) and B(-6,-9) using Bresenham's line drawing algorithm. 8
4. a) What is windowing and clipping? Derive window to viewport transformation matrix. 7
   b) Apply Cohen Sutherland line clipping algorithm for calculating the saved portion of a line from (2,7) to (8,12) in a window (X_{wmin} = Y_{wmin} = 5 and X_{wmax} = Y_{wmax} = 10) 8
5. a) Define Projection? Derive a matrix for a parallel projection. 7
   b) Calculate (x, y) coordinate of Bezier curve described by the following 4 control points (0, 0), (1, 2), (3, 3), (4, 0). Assume any needed values. 8
6. a) Explain the Gouroud shading method with its advantages. 5
   b) Explain why is RGB called as additive and CMYK called as subtractine model? 5
   c) Explain open GL.
7. Write short notes on: **(Any two)**
   a) Explain shading method of intensity interpolation.
   b) Explain different file formats.
   c) Viewing in 3D

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Fall

Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain the use of computer graphics emphasizing the application of graphics in the field of entertainment. 8

   b) Consider a non-interlaced raster monitor with a resolution of 1280x1024. If horizontal and vertical retrace times are 20 microsecond each, than calculate the fraction of the total refresh time per frame spent in retrace of the electron beam? Assume refresh rate of 60 frames per second. 7

2. a) Define Video Controller? Differentiate between Beam penetration and shadow mask method? 8

   b) Explain the working of DDA line drawing algorithm with suitable examples. Write its advantage and disadvantage. 7

OR

Explain Symmetrical property of circle. Write midpoint circle algorithm and apply that algorithm to find the pixel values of the circle whose radius r = 10 and centre of the circle = (0, 0).

3. a) Define Decision Parameter in Bresenham's line drawing? Digitize a circle $(x-2)^2 + (y-3)^2 = 25$ using a midpoint circle drawing algorithm. 8

   b) Determine window to viewport transformation matrix for window (5, 10) (15, 20) and for viewport (8, 12) (12, 18). Note the coordinates values are for lower left and upper right corner. 7

4. a) Why do you need clipping? Explain the Cohen Sutherland line clipping algorithm. 8

   b) Derive the composite matrix for reflection an object about an arbitrary axis in 3D Space. 7

5. a) Explain and derive transformation matrix of 3D rotation about a line 8

not parallel to any one axis.

b) Distinguish between Image space and Object space method. How A-buffer method removes the drawback of Z-buffer method. 7

6. a) What do you mean by ambient light? Compare between Additive and subtractive color model. 7

b) Define OPenGL? Explain the different file format used in Graphics to save image. 8

7. Write short notes on: (Any two) 2×5

a) Pros and Cons of Vector Graphics

b) A-Buffer Method

c) Need for Machine Independent Graphical Languages.

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Spring

Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is computer Graphics? How it is used in education and training and entertainment? 8

b) Explain the architecture of raster scan system with importance of video controller. 7

2. a) Explain the Bresenham's Line drawing algorithm with suitable example. 8

b) Derive mid-point Circle algorithm. 7

3. a) What is clipping? Explain Cohen Sutherland's line clipping algorithm with suitable example. 8

b) Explain 2D transformation using Homogeneous coordinator system. 7

4. a) Explain Beizer curve and also specify the properties of Beizer curve 8

b) Explain and derive parallel projection transformation matrix. 7

5. a) What is Hidden surface? Explain the back face detection method 7

b) Explain Gouraud and phong shading method with its advantages and disadvantages. 8

6. a) Explain ambient, diffuse and specular reflection. 7

b) Explain about PHIGS and GKS language. 8

7. Write short notes on: (Any two) 2×5

a) Touch panel

b) Area Subdivision Method

c) OPENGL

POKHARA UNIVERSITY

Level: Bachelor
Programme: B E
Course: Computer Graphics

Semester: Fall

Year : 2020
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

a) How the entertainment and gaming industry has revolutionized by the advancement in computer graphics explain your answer with some real life examples. 7

b) Discuss the difference between raster and random scan display system with its architectural diagram. 8

a) Derive an equation for calculating points of an ellipse. 7

b) Rasterize the points of given line end points A (-2 , -4) and B (-6,-9) using Brenham's line drawing algorithm. 8

a) Find the Transformation matrix for window to viewport Transformation. 7

b) What is windowing and clipping; how a polygon can be clipped explain? 8

a) Derive equation for Bezier curve in quadratic polynomial and specify the blending function 7

b) Define projection. Difference between parallel and perspective projection with figure 8

a) Explain the importance of hidden surface removal in computer graphics, explain scan line method of hidden surface removal. 7

b) Differentiate between Gouraud and phong shading with algorithm. 8

6. a) What is color model. Explain RGB and CMYK color model. 7

b) Explain GKS and PHIGS. Also list out the available graphical file format. 8

7. Write short notes on: **(Any two)**

a) Light pen

b) A-Buffer Method

c) Need of illumination Model

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Fall

Year : 2021
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define computer graphics. List the application of computer graphics in different fields. 7

   b) In a true color system having resolution of 1024*768 having the refresh rate of 60fps calculate the following 8

      i. Size of frame buffer

      ii. Access time of one frame

      iii. Access time for one pixel

      iv. Access time for one row

   Note: convert your memory into Mega Byte.

2. a) Differentiate between raster and Vector scan display system along with their architecture. 8

   b) Digitize the first octant of a circle having radius r=8 and centered at (3,4) 7

3. a) Prove that successive translation and rotation is additive. 8

   b) Explain the role of composite transformation in 2D/3D geometric transformation. Explain viewing pipelining in 2D. 7

4. a) What is 3D transformation? Rotate the triangle A(0,0), B(2,2), C(4,2) about the origin by an angle of 45°. 8

   b) How you represent different objects in 3D. Differentiate between parallel and perspective projection with example? 7

5. a) What is Mach band effect? Differentiate between Gouraud and Phong shading. 8

   b) Define color model in computer graphics. Differentiate between additive color and subtractive color. 7

6. a) Explain the importance of hidden surface removal in computer graphics. What are the drawbacks of z-buffer method and how it is corrected in A-buffer?

   b) Explain how machine independent graphical language are more preferable to develop graphical project.

7. Write short notes on: **(Any two)**

   a) Open GL

   b) Beizer curve

   c) Polygon Table

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Spring

Year : 2021
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

a) Compare and contrast the Raster and Random system with the necessary diagram. 7

b) Define resolution and persistence. Explain the digital to analog converter in frame buffer organization? 8

a) Write Bresenhams line drawing algorithm along with necessary derivation for positive slope less than 1 i.e. $|m|<1$.Trace the algorithm for the line with end points A(6,12) and B(10,15). 8

b) Explain the Sutherland Hodgeman polygon clipping algorithm considering the four different cases. 7

OR

Let R be the rectangular window whose lower left hand corner is at L (-3. 1) and upper right-hand corner is at R (2, 6). Use Cohen – Sutherland algorithm to clip the line segments A (-4, 2) and B (-1, 7).

a) Derive a composite transformation matrix for reflecting an object about a line y=x+4 in 2D 7

b) Differentiate between window and viewport. Derive a matrix for window to viewport transformation. 8

a) What do you mean by a projection? Derive an expression to obtain the perspective projection of any arbitrary point. 7

b) Why filling algorithm is required in computer graphics? Explain about scan line polygon filling algorithm. 8

a) What are the different ways of representing 3D objects in computer Graphics? Explain how can you represent a polygon surface as a 3D-object. 8

b) Why is it necessary to detect visible surfaces, in case of 3D viewing? Explain Z-buffer Algorithm for hidden surface removal. 7

a) Describe how Gouraud Shading algorithm can be used in rendering a realistic 3D object. 7

b) Why do we need the machine independent graphical languages? List out some of the graphical file formats and explain them in short. 8

7. Write short notes on: (Any two)

a) Diffuse us specular Reflection
b) Color models
c) Application of computer graphics

POKHARA UNIVERSITY

Semester: Fall

Level: Bachelor
Programme: BE
Course: Computer Graphics

Year : 2022
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

a) Define Computer Graphics? Explain the applications of CG in Computer Simulation, Scientific Visualization and CAD. 7

b) Define Refresh rate and Resolution. Consider a raster scan system having 20-inch by 30-inch screen with a resolution of 300 pixels per inch in each direction. If the display controller of the system refreshes the screen at a rate of 60 frames per second, how many pixels could be accessed per second and what is the access time per pixels of the system. 8

a) Define CRT? Explain with neat diagram about the working principle of shadow mask method? 7

b) Consider a line from (2,1) to (8,3) using DDA algorithm to rasterize a line. 8

a) Explain the boundary fill algorithm in detail. How this approach differs from flood fill? 8

b) Prove that: 7

i. Two successive Translations are Additive

ii. Two successive Scaling are Multiplicative

a) Window port is given by (100,100,300,300) and viewport is given by (50,50,150,150). Convert the window port coordinate (200,200) to the viewport coordinate. 7

b) A mirror is placed vertically such that it passes through the points (5, 0) and (0, 5). Find the reflected view of triangle ABC with coordinates A (5, 30), B (30, 50) and C (20, 60). 8

a) How do you represent 3D objects by using Polygon Tables? How is the consistency of geometric data table checked and what are the rules for generating error free polygon tables? 7

b) What is OpenGL? Why GLUT is implemented in OpenGL Explain Callback function. 8

6. a) Derive the equation for cubic Bezier curve and find the coordinate at t=0.2 with respect to the control points (1, 1), (4, 6) (8,-3) and (12, 2). 8

b) Why depth sorting method is called Painter's Algorithm? Explain scan line method for visible surface detection with an example. 7

7. Write short notes on: **(Any two)** 2×5

a) Light pen

b) Color models

c) Phone shading

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Computer Graphics

Semester: Spring

Year : 2023
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define computer graphics with its type. How has the evolution of computer graphics technology impacted the gaming industry in terms of realism and player immersion? 8

   b) Graphical systems are composed of DAC and Frame Buffer organization. Why? Explain the working principle of Data gloves with example. 7

2. a) 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 60 frames per second? 7

   b) Why Circle and Ellipse uses different point symmetry? Explain the mid-point circle generation algorithm by calculating its initial decision parameter. 8

3. a) What is uniform scaling? Reflect an object (2, 3), (4, 3), (4, 5) about line $y = x + 1$. 8

   b) How is Scan line algorithm different from Flood fill algorithm for filling polygons? Explain. 7

4. a) What do you understand by the term clipping? Explain the Cohen-Sutherland line clipping algorithm with suitable example. 8

   b) Why we need the machine independent graphical language? Explain two different graphical software standards. 7

5. a) Define blobby objects with example. What is cubic Bezier curve? Derive the equation of Cubic Bezier curve. 8

   b) Why is it required to detect visible surfaces in 3D viewing and not in 2D? How is Back face detection approach different from Z Buffer approach for detecting visible surfaces? 7

6. a) Explain the 3D viewing pipeline. Briefly explain the significance of World coordinate system, Viewing coordinate system, Normalized viewing coordinate system and Device coordinate system in the viewing pipeline. 8

   b) What is illumination model? Differentiate between Phong Shading and Gouraud Shading. 7

7. Write short notes on: (Any two) 2×5

   a) Specular Reflection

   b) Parallel vs. Perspective Projection

   c) Area Subdivision Method