University of Rajshahi

Department of Computer Science and Engineering

B. Sc. (Engg.) Part-III Even Semester Examination 2020

Course: CSE-3221 (Computer Graphics)

Full Marks: 52.5 Duration: 3(Three) Hours

Answer 06(Six) questions taking any 03(Three) questions from each part

Part A

1	(a)	State and explain the midpoint circle algorithm.	5.00
	(b)	To illustrate the Bresenham line drawing algorithm digitize the line with end points (20, 10) and (30, 18). The line has a slope of 0.8.	3.75
2.	(a)	Given points P1(1,2,0), P2(3,6,20), and P3(2,4,6) and a view point C(0,0,-10), determine which points obscure the others when viewed from C.	3.25
	(b)	What is the maximum number of objects that can be presented by using Z-buffer algorithm?	0.50
	(c)	The matrix $\begin{pmatrix} 1 & a \\ b & 1 \end{pmatrix}$ defines a transformation called a simultaneous shearing or shearing for short. The special case when b=0 is called shearing in the x-direction. When a=0, we have shearing in the y-direction. Illustrate the effect of shearing transformations on the square A(0,0), B(1,0), C(1,1), and D(0,1) when a=2 and b=3.	5.00
3	(a)	What is the condition for point clipping?	1.00
	(b)	Define clipping and clip window.	2.00
	(c)	Sate and explain the Cohen-Sutherland line clipping procedure.	5.75
4.	(a)	In 3D object representations what do you understand by "Torus"?	1.00
	(b)	Define "Convex hull" and "Control graph" for specifying a spline curve.	2.00
	(c)	State and explain the "Cardinal splines" as a method for interpolating piecewise cubics.	5.75

Part B

5.	(a)	Define "Fractal-geometry method" for describing natural objects.	1.75
	(b)	What are the classifications of fractals? Define these.	3.00
	(c)	Explain with neat diagrams for geometric construction of deterministic self-similar fractals.	4.00
6	(a)	What do you understand by visible surface and hidden surface of a 3D objects? Illustrate.	1.75
	(b)	Why depth-sorting method is commonly known as painter's algorithm?	1.00
	(c)	State and explain Area-subdivision method for hidden surface removal.	6.00
7.	(a)	Find the general form of an oblique projection onto the xy plane.	2.75
	(b)	Write down the difference between: I. Direct clipping and canonical clipping II. Bezier curve and B-spline curve III. Cavalier oblique projection and cabinet oblique projection	6.00
8.	(a)	Draw the electromagnetic spectrum and label the different frequency band.	1.75
	(b)	Define shades, tints and tons of a color.	1.50
	(c)	Explain the HSV color model.	5.50

Rajshahi University
Department of Computer Science and Engineering
B.Sc(Engg.) Part-III, Even semester Examination-2019
Course: CSE-3221(Computer Graphics)
Full Marks-52.5; Time: 3hours

Answer any Six(06) questions taking at least Three (03) from each section.

Section-A

1.	a)	State and explain Bresenham's line generating algorithm.	4.75
	b)	Given a circle radius r=10. Demonstrate the midpoint circle drawing algorithms determining position along the circle octant in the first quadrant from x=0 to x=y.	4
2.	a)	Define Translation, Rotation and Scaling for two dimensional geometric transformations.	3
	b)	With neat diagrams, explain the general pivot-point rotation for two dimensional geometric transformations.	3
	c)	Explain how a shearing transformation can be used to modify 3-dimensional object shapes.	2.75
3.	a)	Define 'window' and 'viewport' in 2-dimensional viewing.	2
	b)	Explain the process of window-to-viewport coordinate transformation.	3.75
	c)	Illustrate and explain the Weiler-Atherton polygon clipping algorithm.	3
4.	a)	Define 'interpolation' and 'approximation' splines.	2
	b)	What are the parametric continuity conditions to ensure smooth transition from one section of a precise parametric curve to the next?	2
	c)	State and explain the Hermite interpolation.	4.75

Section-B

5.	a)	How can you construct a solid by translating sweep and rotational sweep?	3
	b)	Define 'voxel'.	1
	c)	With neat diagrams, explain the Euler's formula for modeling polyhedra.	4.75
6.	a)	What do you understand by 'fractal dimension'?	2
	b)	How can you construct a fractal by Random Midpoint Displacement method?	4
	c)	Explain self-inverse fractal.	2.75
7.	a)	Define 'object space method' and 'image space method'.	2
	b)	Summarize the steps of depth buffer algorithm.	3
	c)	State and explain the Binary Space Partitioning (BSP) tree as an efficient method for determining object visibility.	3.75
8.	a)	Define dominant frequency.	1
	b)	What is meant by purity of color? Explain the RGB color model.	4
	c)	What do you understand by chromaticity of color?	2
	d)	Explain why a color printer uses CMY-K color model to print on white paper.	1.75

University of Rajshahi
Dept. of Computer Science and Engineering
B.Sc.(Engg.), Part-III (Even Semester), Examination 2018
Course: CSE3221 (Computer Graphics)
Full Marks: 52.50 Time: 3 hours

[Answer any six questions taking three from each section]

Section A

1. a) To Illustrate the Bresenham's Line Drawing algorithm, digitize the line with endpoints (20, 10) and (30, 18) with a shape of 0.8 with $\Delta x = 10$ and $\Delta y = 8$ 4.00

   b) Explain midpoint circle drawing algorithm. Is there any advantage of using this algorithm over other circle drawing algorithm? 4.75

2. a) In 2-Dimensional composite Transformation, when concatenating successive scaling operations, the resulting output is "Additive" or "Multiplicative"? 1.00

   b) With neat diagrams, explain 2D General Pivot-point Rotation. 3.75

   c) Draw and label the reflection of an object relative to an axis perpendicular to the XY plane and passing through point P_{rfl}. 1.50

   d) Only with neat diagram, illustrate the 3D scaling operation with respect to a selected fixed position (x_f, y_f, z_f). 2.50

3. a) What is transformation? Explain the difference between geometric transformations and coordinate transformation. 3.00

   b) Perform a 60^0 rotation of a triangle A(1,1), B(11, 2) and C(5,5) about the origin and about P(-1, 0). 4.75

   c) How can you create a mirror image of a 2D object? 1.00

4. a) Suppose you have a system with an 8-inch by 10-inch video screen that can display 100 pixels per inch. If a color lookup table with 64 positions is used with this system. What is the smallest possible size (in bytes) for the frame buffer? 2.75

   b) Derive the following equations for transforming a coordinate point $P = (x, y)$ in one two-dimensional Cartesian system to the coordinate values (x', y') in another Cartesian system that is rotated counterclockwise by an angle θ relative to the first system. The transformation equations can be obtained by projecting point P onto each of the four axes and analyzing the resulting right triangles. 6.00

$$x' = x\cos\theta + y\sin g\theta \qquad y' = -x\sin\theta + y\cos\theta$$

Section B

5. a) What do you mean by fractals? 2.00

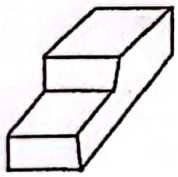
   b) Define self-similar, self-affine and invariant fractals. 2.00

   c) Illustrate and explain the geometric construction of deterministic self-similar fractals. 4.75

6. a) Define "Parallel Projection" and "Perspective Projection" in 3-Dimensional viewing. 2.00

   b) What do you mean by vanishing point in perspective projection? 1.00

   c) Draw the axonometries orthographic projection of the object: 3.75



   Draw plan and side elevations.

   d) What do you understand by "Parallelepiped view volume" and "Frustum view volume"? 2.00

7. a) What is meant by "depth Z" for each (x,y) position in a view plane. 2.75

   b) State and explain "Depth-sorting algorithm" which is commonly known as "Painter's algorithm". 6.00

8. a) Draw the electromagnetic spectrum and mention the visible frequency band. 2.00

   b) Define "Shades", "Tints", and "Tones" of a color. 1.75

   c) Explain HSV color model. 5.00

University of Rajshahi
Department of Computer Science and Engineering
B. Sc. (Hons.) Part-III Even Semester Examination 2017
Course: CSE 3221 (Computer Graphics)
Full Marks: 52.5 Time: 3 Hours
[Answer any six questions taking 3 from each Section]

Section A

1. a) Explain the working principle of Liquid Crystal Display (LCD) as a flat panel display device. 4
   b) State and explain Bresenham's Line Drawing algorithm. 4.75

2. a) Define differential scaling. 1
   b) With neat diagrams, explain 2D general fixed-point scaling. 3
   c) Explain the Weiler-Atherton polygon clipping algorithm. 4.75

3. a) What do you understand by "Blobby" objects? 2
   b) Define "Convex hull" and "Control polygon". 2
   c) State and explain "Cardinal splines" as an interpolating piece wise cubic polynomials. 4.75

4. a) Describe Cohen-Sutherland line clipping algorithm. 4.75
   b) Use the Cohen-Sutherland algorithm to clip line P1 (70,20) and P2 (100,10) against a window lower left hand corner (50, 10) and upper right hand corner (80, 40) 4

Section B

5. a) What is meant by sweep representations to create a volume? 2
   b) Explain "Polyhedra and Euler's Formula". 3
   c) Explain "Octree" as a hierarchical variant of spatial-occupency enumeration. 3.75

6. a) What do you understand by Fractal geometry methods? 2
   b) Explain fractal dimension. 2
   c) Explain self-squaring fractals as a method for generating fractal objects. 4.75

7. a) Define "Object-space method" and "Image-space method" in the light of visible surface detection algorithm. 2
   b) Summarize the steps of a depth-buffer algorithm. 3
   c) Explain Binary space-partitioning (BSP) tree as an efficient method for determining object visibility. 3.75

8. a) What is color model? Define RGB model. What do you mean by indexed color? 3
   b) Show and explain the relationship among RGB, CMY and HSV color model with necessary diagram. 3.75
   c) Define dominant "frequency", "saturation" and "chromaticity". 2

University of Rajshahi
Department of Computer Science and Engineering
B. Sc. Engg. Part3 Even Semester, Examination-2016
Course: CSE-3221 (Computer Graphics)

Full Marks: 52.5 Time: 3 Hours

[Answer three questions from each part]

Part A

1. a) To illustrate the Bresenham line drawing algorithm, digitize the line with endpoints (20, 10) and (30, 18). The line has a slope of 0.8 with $\Delta x=10$ and $\Delta y=8$. 3
   b) Explain midpoint circle drawing algorithm. 5.75

2. a) Classify the projections. Explain the properties of each. 3
   b) What are the basic transformation techniques used in Window-to-Viewpoint transformation? Derive the viewing transformation matrix. 4
   c) Explain why it is essential that clipping take place before projection. 1.75

3. a) With neat diagram, explain 2D general pivot point relations. Rotation. 4
   b) Draw a diagram to illustrate reflection of an object with respect to the line y=x. 1.75
   c) Only with neat diagrams show the sequence of transformations for rotating an object about an axis that is parallel to the x-axis. 3

4. a) What are the steps involved in Cohen-Sutherland algorithm for line clipping. 4
   b) What is "canonical viewing space"? Describe in detail the Sutherland-Hodgeman algorithm for clipping a polygon to the view volume in this space. 3
   c) Distinguish between Cohen-Sutherland and Sutherland-Hodgeman algorithms. 1.75

Part B

5. a) What do you mean by 'Torus" as a quadratic surface? 2
   b) Define interpolation and approximation of splines. 2
   c) State and explain "Hermite Interpolation" as an interpolating piece wise cubic polynomial. 4.75

6. a) Define "Voxels" and "Cuberille". 1
   b) Explain "Self-similar" and "Self-affine" fractals. 4
   c) Describe the geometric construction of a deterministic self-similar fractals. 3.75

7. a) Define view plane and view reference point. 1
   b) What do you mean by perspective projection of a 3D object? 2
   c) Explain the "Painters Algorithm' for solving the hidden-surface problem. 5.75

8. a) Describe the components of YIQ, CMY and HSV models. 4.5
   b) What is a color gamut? From what limitation do all color gamuts suffer in practice? 2.25
   c) State the use of chromaticity diagram. 2

University of Rajshahi
Department of Computer Science and Engineering
B. Sc. (Engg.) Part-III Semester II Examination 2015
Course: CSE 3221 (Computer Graphics)
Full Marks: 52.5 **Time: 3 Hours**

[Answer any Six questions taking three from each group]

Group A

1. a) State and explain Bresenham's line-generating algorithm. 5.75
   b) Given a circle radius: r=10. Demonstrate the midpoint circle algorithm by determining position along the circle octant in the first quadrant from x=o to x=y. 3

2. a) What do you mean by "translation vector" and "differential scaling"? 2.5
   b) Discuss the concept of "general fixed point scaling". 3.5
   c) Explain "shear" as a 2D geometric transformation. 2.75

3. a) State and explain Weiler-Atherton Polygon clipping algorithm. 3
   b) What do you mean by "Control graph" and "Control polygon"? 1
   c) Explain the Cardinal Spline interpolation method. 4.75

4. a) Explain with neat diagrams, the Fractal Dimension, to describe the detail variation in fractal objects. 4
   b) Illustrate and explain the "Self-squaring" fractals as a method for generating fractal objects. 4.75

Group B

5. a) With detailed pictorial representation, write down the 3D scaling transformation with respect to a selected fixed position. 3
   b) What do you mean by sweep representations? 1.75
   c) Briefly discuss the Polyhedra and Euler's formula with examples.. 4

6. a) Define visible surface of a 3D object. 1
   b) Explain the Depth-Buffer method for solving the hidden surface problem. 4.75
   c) Show that the "Binary Space Partitioning (BSP)" tree is an efficient method for object visibility. 3

7. a) Draw the electromagnetic spectrum and show the visible range of frequency in Hz. 1.75
   b) Define "purity" and "chromaticity" of color characteristics. 2
   c) Based on the tristimulus theory of vision, explain the RGB color model. 5

8. a) Define "Axonometric orthographic projections", "Vanishing point" and "View volume" with examples by diagrams. 3.75
   b) Explain general parallel projection transformation. 5

University of Rajshahi
Department of Computer Science and Engineering
B. Sc. (Engg.) Part-3, Even Semester Examination-2014
Course: CSE 3221 (Computer Graphics)

Time: 3 Hours | Total Marks: 52.5

[Answer Six questions taking Three from each Part.]

PART-A

1	a)	Describe the working principle of Shadow-mask method as it used in Raster-scan system.	4
	b)	With a neat diagram describe the liquid-crystal display (LCD) as a Flat-Panel Display device.	4.75
2	a)	To illustrate the Bresenham Line Drawing Algorithm digitize the line with endpoints (20, 10) and (30, 18). This line has a slope of 0.8, with $\Delta x=10$ and $\Delta y=8$.	3
	b)	Explain Midpoint Circle Drawing Algorithm.	5.75
3	a)	What is transformation? Explain the difference between geometric transformation and coordinate transformation?	3
	b)	Perform a 60^0 rotation of a triangle A(0, 0), B(1, 1) and C(5, 2) about the origin and about P(-1, -1).	4
	c)	How can you create a mirror image of a 2D object?	1.75
4	a)	Define window and viewpoint.	2
	b)	Illustrate the process for window to viewport coordinate Transformation.	3
	c)	Write the Sutherland-Hodgeman polygon clipping.	3.75

PART-B

5	a)	Define Interpolation and Approximation.	2
	b)	What are the parametric continuity conditions to ensure the smooth transition of a curve section?	2
	c)	Explain the Hermite Interpolation method.	4.75
6	a)	What is meant by fractals?	1
	b)	Define self-similar, self-affine and invariant fractals.	3
	c)	Illustrate and explain the geometric construction of deterministic self-similar fractals.	4.75
7	a)	Define hidden surface. Why hidden surface elimination is required?	2.5
	b)	Explain Painter's algorithm for solving the hidden surface problem.	4.5
	c)	Write the properties of Bezier curves.	1.75
8	a)	Define Dominant Frequency.	1
	b)	Define "Shade" and "Tint".	2
	c)	Explain and illustrate the HSV color model with neat diagram.	5.75