Code No: R1621056 **R16** SET - 1

**II B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019**
**COMPUTER GRAPHICS**
(Computer Science & Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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## PART –A

1. a) Explain text clipping. (3M)
   b) Calculate the clipping window height for the perspective-projection frustrum. (3M)
   c) Show the steps in morphing a line into two lines with included angle. (2M)
   d) Explain Frame mapping. (2M)
   e) Explain Julia sets. (2M)
   f) How do you reduce Ray-surface intersection calculations? (2M)

## PART -B

2. a) Derive the concatenated transformation matrix to zoom a square about its center. (7M)
   b) Use the midpoint method and symmetry considerations to scan convert the parabola $x = y^2$ for the interval x varying between (-10 to 10) (7M)

3. a) Consider the defining polygon $B_1[1 \quad 1],\ B_2[2 \quad 3], B_3[4 \quad 3], B_4[3 \quad 1]$ of the open B-spline curve. Determine the first derivative of the second order curve? (7M)
   b) Derive the resultant transformation matrix to rotate a given point about an arbitrary axis (7M)

4. a) Write a program/algorithm to implement the simulation of a bouncing ball. (7M)
   b) Write an OpenGL program to display a set of diagonal lines using any one-dimensional texture pattern. (7M)

5. Write a complete OpenGL program to display a set of diagonal lines using various one dimensional texture patterns. (14M)

6. a) Using the random mid-point displacement method, write a routine to create a mountain outline, starting with a horizontal line in the xy-plane. (10M)
   b) Explain self similarity of fractals. (4M)

7. a) Derive Ray-sphere intersection mathematics. (7M)
   b) Explain with an example how to reduce object-intersection calculations using ray-tracing. (7M)



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Code No: R1621056 **R16** SET - 2

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**COMPUTER GRAPHICS**
(Computer Science & Engineering)

Time: 3 hours Max. Marks: 70

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2. Answer **ALL** the question in **Part-A**
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## PART –A

1. a) Supply the two dimensional viewing transformation matrix and interpret the same. (2M)
   b) Obtain the oblique parallel projection coordinates of point (x,y,z). (3M)
   c) Explain YIQ color model. (3M)
   d) Contrast between the texture and bump mappings. (2M)
   e) Write a note on Peano curves. (2M)
   f) Obtain the unit transmission vector **T** in the refraction direction. (2M)

## PART -B

2. a) Devise a parallel method for implementing a line-style function. (7M)
   b) Use the glutsetcolor function to setup a color table for an input set of color values. (7M)

3. a) Develop a routine to reflect a 3-D object about an arbitrarily selected plane. (7M)
   b) Develop an algorithm for calculating the normal vector to a B-spline surface at a given point P(u,v). (7M)

4. a) Write a morphing program to transform a sphere into a specified octahedron. (7M)
   b) Explain OpenGL three dimensional viewing functions. (7M)

5. Write an OpenGL program to display a scene containing a sphere and a tetrahedron illuminated by two light sources: one is to be a local red source and the other a distant white light source. Set surface parameters for both diffuse and specular reflections with Gourand shading surface rendering, and display a quadratic intensity-attenuation function. (14M)

6. a) Write a program to display the fractal snowflake (Koch curve) for a given number of iterations. (10M)
   b) Explain Mandelbrot sets. (4M)

7. a) Compute the ray-sphere intersection equation using the quadratic formula, and show how it can be simplified to determine only whether or not the ray and sphere intersect. (10M)
   b) Explain Boolean operations on objects through an example. It should involve atleast 4 operations. (4M)



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Code No: R1621056 **R16** SET - 3

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(Computer Science & Engineering)

Time: 3 hours Max. Marks: 70

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2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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## PART –A

| | | | |
|---|---|---|---|
| 1. | a) | Why do you take unit steps along x-axis in Bressenham's line generation algorithm? | (2M) |
| | b) | Supply and explain general perspective transformation matrix. | (3M) |
| | c) | Draw the RGB color model cube and explain how shades of Gray are represented. | (3M) |
| | d) | Explain adding shadows of objects. | (2M) |
| | e) | What is fractal dimension? | (2M) |
| | f) | What is the mapping from texture space to object space? | (2M) |

## PART -B

| | | | |
|---|---|---|---|
| 2. | a) | OpenGl antialiasing functions and Query functions. | (7M) |
| | b) | Derive the ellipse drawing algorithm. | (7M) |
| 3. | a) | Derive the composite transformation matrix to align an arbitrary vector in 3-D space with the Z-axis | (7M) |
| | b) | Derive the blending functions for a a two dimensional, uniform, periodic B-spline curve of degree of degree 3 assuming the number of control points to be 5. | (7M) |
| 4. | | Devise an algorithm for generating solid objects as combination of 3-D primitives using Constructive solid geometry scheme. | (14M) |
| 5. | | Setup an algorithm , based on one of the visible-surface detection methods, that will identify shadow areas in a scene illuminated by a distant point source. | (14M) |
| 6. | a) | Explain how to control Terrain topography. | (10M) |
| | b) | Write a program to display the fractal snowflake(Koch curve) for a given number of iterations. | (4M) |
| 7. | a) | Derive Ray-polyhedron intersection mathematics. | (10M) |
| | b) | Discuss distributed ray tracing. | (4M) |



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Code No: R1621056 **R16** SET - 4

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**COMPUTER GRAPHICS**
(Computer Science & Engineering)

Time: 3 hours Max. Marks: 70

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2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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**PART –A**

| | | | |
|---|---|---|---|
| 1. | a) | Supply Open GL attribute groups. | (2M) |
| | b) | Explain B-Spline basis. | (3M) |
| | c) | Provide the basic equations of XYZ color model. | (3M) |
| | d) | Explain creating shaded objects. | (2M) |
| | e) | What are Mandelbrot's sets- explain? | (2M) |
| | f) | Explain two Boolean operations on objects. | (2M) |

**PART -B**

| | | | |
|---|---|---|---|
| 2. | a) | Derive the necessary mathematics for transformation between two-dimensional coordinate systems. | (7M) |
| | b) | Supply the OpenGl raster transformation functions. | (7M) |
| 3. | a) | Provide GLU quadric surface functions. | (7M) |
| | b) | Explain GLU-surface trimming functions with an example. | (7M) |
| 4. | a) | Write a morphing program to transform a sphere into a specified hexahedron. | (7M) |
| | b) | Explain sweep and octree schemes of solid modeling. | (7M) |
| 5. | | Write a program using a two dimensional OpenGL texture pattern to display a white rectangle with a set of evenly spaced diagonal red strips. Set the background color to blue. | (14M) |
| 6. | a) | Derive the necessary mathematics of self-squarring fractals. | (10M) |
| | b) | Discuss shape grammer and other procedural methods. | (4M) |
| 7. | a) | Show how can you estimate an object's volume using ray-tracing algorithm. | (10M) |
| | b) | Discuss antialiased Ray tracing. | (4M) |



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