Computer Graphics and Visualization VTU CBCS Question Paper Set 2018

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10CS65

Sixth Semester B.E. Degree Examination, Dec.2015/Jan.2016

Computer Graphics and Visualization

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. Support your answer with diagrams wherever necessary.

PART – A

1 a. With the aid of neat diagrams, explain the different Graphics architectures supported by graphics API. **(10 Marks)**

b. Explain the concept of a pinhole camera. Derive the expression for the angle of view. Also indicate the advantages and disadvantages of the pinhole camera. **(10 Marks)**

2 a. Write an openGL recursive program for 2D sierpinski gasket with relevant comments. **(10 Marks)**

b. List the major groups of API functions in openGL. With examples explain any four of them. **(10 Marks)**

3 a. What are the major characteristics that describe the logical behavior of an input device? Explain how openGL provides the functionality of each of the classes of logical input devices? **(10 Marks)**

b. Discuss the request mode, sample mode and event modes, with the figures wherever required. **(10 Marks)**

4 a. Differentiate vector space, Euclidian space and affine space. List the geometric objects and associated operations in affine space. Mention the advantages of affine space transformation. **(10 Marks)**

b. Explain the different openGL frames embedded in pipeline architecture. **(10 Marks)**

PART – B

5 a. Derive the 3D matrix representation for translation rotation scaling and shear. **(10 Marks)**

b. Derive an expression for the rotation of an object about an arbitrary axis. Give the matrix representation of the concatenated matrix. **(10 Marks)**

6 a. With diagrams, explain the different projections in classical viewing. Give the advantages and disadvantages of each projection. **(10 Marks)**

b. Discuss the following openGL functions:
i) gluLookAt ii) gluPerspective iii) glFrustum iv) glortho. **(10 Marks)**

7 a. Explain the Phong Lighting Model. Indicate the advantages and disadvantages of this model. **(10 Marks)**

b. Explain different shading models available for shading a polygonal mesh. **(10 Marks)**

8 a. Explain the Cohen – Sutherland line clipping algorithm. Mention the drawbacks of this algorithm and also mention how it is overcome. **(10 Marks)**

b. Explain the following hidden surface removal methods
i) z – buffer algorithm ii) Painter's algorithm **(10 Marks)**

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Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Discuss the applications of computer graphics. **(04 Marks)**

b. Describe the working of a pen plotter model. Write a code fragment of a simple program in pen plotter that would generate the output shown in Fig. Q1 (b). **(06 Marks)**

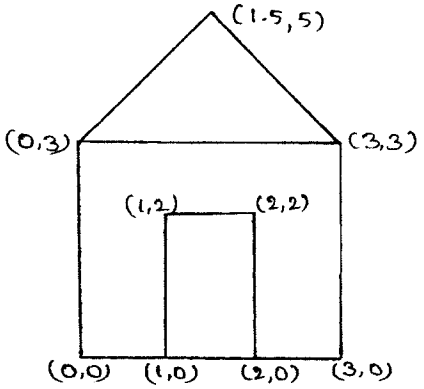

Fig. Q1 (b)

c. Explain the elements of a graphics system, with a neat diagram. **(10 Marks)**

2 a. Write an OpenGL recursive program for 3D Sierpinski Gasket by subdivision of a tetrahedron. **(10 Marks)**

b. Write the different OpenGL primitives, explain each primitive with an example. **(10 Marks)**

3 a. List the three input modes and discuss them with the figures where ever required. **(10 Marks)**

b. Write an OpenGL program to draw a small box at each location on the screen where the mouse cursor is located at the time, that the left button is pressed and right button to terminate the program. **(10 Marks)**

4 a. Explain the procedure of converting a world object frame into camera or eye frame using model view matrix. **(10 Marks)**

b. Explain the following:
i) Affine space.
ii) Vector-vector addition. **(04 Marks)**

c. Given a 2D object with the vertices {(1, 1), (3, 1), (2, 3)}. Rotate this object about the origin by 90°. Calculate the new values by using 2D rotation matrix. Draw the original and the rotated object. **(06 Marks)**

PART – B

5 a. Define and represent the following 3D transformations in homogeneous co-ordinate system:
i) Translation ii) Scaling **(10 Marks)**

b. What is concatenation of transformation? Explain 3D rotation about a fixed point. **(10 Marks)**

6 a. Bringout the differences between perspective and parallel projections. **(06 Marks)**
b. Explain the z-buffer algorithm. **(04 Marks)**
c. Derive the simple perspective projection matrix. **(10 Marks)**

7 a. List and explain different classification of light material interactions. **(10 Marks)**
b. Explain the Phong lighting model. Indicate the advantages and disadvantages of this model. **(10 Marks)**

8 a. Explain Cohen-Sutherland line clipping algorithm with an example. **(10 Marks)**
b. Discuss the Bresenham's rasterization algorithm. **(06 Marks)**
c. Explain antialiasing. **(04 Marks)**

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Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018

Computer Graphics and Visualization

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Discuss the applications of computer graphics. **(06 Marks)**

b. With an aid of a functional schematic, describe the graphics pipeline with major steps in the imaging process. **(08 Marks)**

c. Explain the human visual system. **(06 Marks)**

2 a. What is an openGL interface? Write an openGL program for a 2D-Sierpinski gasket using midpoint of each triangle. **(10 Marks)**

b. Explain any two control functions used in openGL. **(04 Marks)**

c. Explain the additive, subtractive and indexed color formation in computer graphics. **(06 Marks)**

3 a. What are the various classes of logical input devices that are supported by openGL? Explain the functionality of each of these classes. **(10 Marks)**

b. Enlist the various features that a good interactive program should posses. **(04 Marks)**

c. Suppose that the openGL window is 500 × 50 pixels and the clipping window is a unit square with the origin at the lower left corner. Use simple XOR mode to draw erasable lines. **(06 Marks)**

4 a. Explain the complete procedure of converting a world object frame into camera frame using the model view matrix. **(12 Marks)**

b. Explain translation rotation, scaling and shearing with respect to 2-dimensions. **(08 Marks)**

PART – B

5 a. What is concatenation transformation? Explain rotation about a fixed point. **(08 Marks)**

b. Explain how quaternions are used in rotation in a three-dimensional space, also list some of its advantages. **(12 Marks)**

6 a. Explain the various types of views that are employed in computer graphics systems. **(10 Marks)**

b. Explain glFrustrum( ) with syntax. **(06 Marks)**

c. Define the term Axonometric projection, also list its types. **(04 Marks)**

7 a. Explain phong-lighting model. **(10 Marks)**

b. Write a program to display a set of values {fi} as a rectangular mesh. **(07 Marks)**

c. List the possible light sources in openGL. **(03 Marks)**

8 a. Explain the cohen-sutherland line clipping algorithm in detail. **(10 Marks)**

b. Discuss the Bresenham's rasterization algorithm. How is it advantageous when compared to other existing methods? Describe. **(10 Marks)**

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Sixth Semester B.E. Degree Examination, June/July 2013
Computer Graphics and Visualization

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define computer graphics? Explain in detail, the application of computer graphics in current day. **(10 Marks)**

b. Explain working of pinhole camera. Derive angle of view. **(10 Marks)**

2 a. List and explain graphics functions. **(10 Marks)**

b. Discuss indexed colour formation in graphics system, with suitable diagram. **(06 Marks)**

c. Define aspect ratio and view ports with diagram. **(04 Marks)**

3 a. Name different graphics input derives. Explain the input modes in detail, with diagram. **(10 Marks)**

b. Write a program on rotating a cube. **(10 Marks)**

4 a. List and explain different fume coordinates in Open GL. **(10 Marks)**

b. Define and discuss with diagram translation, rotation and scaling. **(10 Marks)**

PART – B

5 a. Write a short note on current transformation matrix. **(08 Marks)**

b. What is transformation? Explain affine transformation. **(12 Marks)**

6 a. What are two types of simple projection? List and explain. **(10 Marks)**

b. Derive matrix representation for prospective projection, with diagram if necessary. **(10 Marks)**

7 a. List and explain different light sources in detail with suitable diagram. **(10 Marks)**

b. What are the types of polygon shading? Discuss. **(06 Marks)**

c. Write a brief on global illumination. **(04 Marks)**

8 Write a short notes on :

a. Graphics pipeline architecture

b. Library organization in Open GL

c. Display list

d. Mapping between coordinates. **(20 Marks)**

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Sixth Semester B.E. Degree Examination, June/July 2014
Computer Graphics and Visualization

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. "Computer graphics is an essential applied domain in recent years". Justify. **(06 Marks)**
b. Explain the pinhole camera imaging system, with a neat block diagram. **(06 Marks)**
c. With a neat diagram, explain the graphics pipeline architecture to render an image. **(08 Marks)**

2 a. Explain the seven major groups of OpenGL API functions, with examples for each function. **(10 Marks)**
b. Explain the color contribution for rendering an image in computer graphics. **(10 Marks)**

3 a. What is a measure and trigger of a logical input device? Explain the different modes to obtain the measure, with example. **(06 Marks)**
b. What is a display list? How it increases the performance of a graphics system? Explain with example. **(06 Marks)**
c. List out the characteristics of a good interactive program, with example for each. **(08 Marks)**

4 a. Explain different frame coordinates in OpenGL, with suitable example. **(10 Marks)**
b. Explain translation, rotation and scaling of objects in 2 – dimensions. **(10 Marks)**

PART – B

5 a. How an object transformation is implemented in OpenGL? Explain with suitable example. **(10 Marks)**
b. What are quaternions? How it is useful in a three-dimensional space? **(10 Marks)**

6 a. Explain different types of views in graphics system. **(06 Marks)**
b. How perspective projection differs from orthogonal projection? Give OpenGL functions for the same. **(06 Marks)**
c. Write a program to display a set of values $\{f_i\}$ as a rectangular mesh. **(08 Marks)**

7 a. Explain Cohen–Sutherland clipping algorithm without codes. Explain its advantage over Liang Barsky algorithm. **(10 Marks)**
b. Explain the phong lighting model. **(10 Marks)**

8 Write a short notes on :
a. Light sources
b. Liang Barsky clipping algorithm
c. Hidden surface removal
d. Rasterization. **(20 Marks)**

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Sixth Semester B.E. Degree Examination, June/July 2015
Computer Graphics and Visualization

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What is computer graphics? List and explain major categories of applications of computer graphics. **(10 Marks)**

b. Explain graphics pipeline architecture with neat diagram. **(10 Marks)**

2 a. Write a c/c++ program to recursively subdivide a tetrahedron to form 3D Sierpinski gasket. The number of subdivision is to be specified by the user. **(12 Marks)**

b. List and explain the major categories of graphics API functions. **(08 Marks)**

3 a. Define trigger of a device and measure of a device. List and explain various input modes. **(10 Marks)**

b. What is double buffering? How OpenGL implements double buffering? Explain. **(06 Marks)**

c. List out any four characteristic of good interactive program. **(04 Marks)**

4 a. Write a program in c/c++ to draw a color cube and spin it using OpenGL transformation matrices. **(12 Marks)**

b. Explain bilinear interpolation of assigning colors. **(08 Marks)**

PART – B

5 a. Explain translation, scaling and rotation of 3D objects in homogeneous coordinate. **(12 Marks)**

b. What are Quaternion's? How it is useful to carry out rotation operation? **(08 Marks)**

6 a. Explain two types of simple projections. **(10 Marks)**

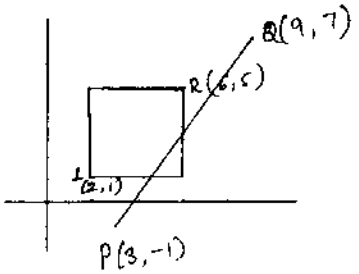
b. Explain projections in OpenGL. **(10 Marks)**

7 a. With neat diagrams, explain various light sources. **(12 Marks)**

b. How material properties are specified in OpenGL? Explain. **(08 Marks)**

8 a. Clip a line PQ against clipping window LR (Fig.Q.8(a)) using Cohen Sutherland line clipping algorithm. Draw the result after clipping. **(10 Marks)**

Fig.Q.8(a)



Data:
P = (3, -1)
Q = (9, 7)
L = (2, 1)
R = (6, 5)

b. What is hidden surface removal in computer graphics? Explain. What are the various approach for hidden surface removal? Explain. **(10 Marks)**

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Sixth Semester B.E. Degree Examination, June/July 2017
Computer Graphics & Visualization

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Briefly explain applications of computer Graphics. **(08 Marks)**

b. Explain the process of image formation with pinhole camera as example. Derive the expression for angle of view. **(12 Marks)**

2 a. Write an OpenGL program to recursively subdivide a tetrahedron to form 3D Sierpinski gasket. **(10 Marks)**

b. Explain the seven major groups of functions of a good API. **(05 Marks)**

c. Briefly explain various polygon types in OpenGL. **(05 Marks)**

3 a. Enlist the features of a good interactive program. **(06 Marks)**

b. How pop-up menus are created using GLUT? Illustrate with an example. **(10 Marks)**

c. What is double buffering? Explain the advantages of double buffering. **(04 Marks)**

4 a. What are vertex arrays? Show how vertex arrays can be used to represent a cube in OpenGL. **(10 Marks)**

b. A square in a two dimensional system is specified by its vertices (6, 6), (10, 6), (10, 10) and (6, 10). Implement the following by its first finding a composite transformation matrix for the sequence of transformation involved. Sketch the original and transformed square.

(i) Rotate the square by 45° about its vertex (6, 6)

(ii) Scale the original square by a factor of 2 about its centre. **(10 Marks)**

PART – B

5 a. Obtain the matrix representation for rotation of a point about an arbitrary axis in a 3D space. **(10 Marks)**

b. Show that the following three dimensional sequences are commute:

(i) A rotation and a uniform scaling.

(ii) Two rotations about the same axis. **(10 Marks)**

6 a. Briefly explain the prespective and parallel views in OpenGL. Give example. **(10 Marks)**

b. What is mesh? With example explain how meshes are generated. Give OpenGL code. **(10 Marks)**

7 a. Describe the Phong lightening model. What are its advantages? **(10 Marks)**

b. Briefly explain the different types of light sources supported by OpenGL. **(10 Marks)**

8 a. Use Liang Barsky line clipping algorithm to clip a line from starting point (30, 15) and ending at point (65, 35) against the window having its lower left corner at (40, 10) and upper right corner at (75, 25) **(10 Marks)**

b. Use Bresenham's line algorithm to digitalize a line from point (0, 0) to point (6, 4). **(10 Marks)**

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Sixth Semester B.E. Degree Examination, Dec.2013/Jan.2014
Computer Graphics and Visualization

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is computer graphics? How is it different from photography? Discuss the major categories of applications of computer graphics. **(10 Marks)**

b. Explain the different graphics architectures in detail, with the aid of functional schematics. **(10 Marks)**

2 a. Write a typical main function that is common to most non-interactive applications and explain each function call in it. **(10 Marks)**

b. Explain the major categories of graphics API functions. **(07 Marks)**

c. Explain "Color Cube" in brief. **(03 Marks)**

3 a. What are the major characteristics that describe logical behaviour of an input device? Explain the various classes of logical input devices supported by openGL. **(08 Marks)**

b. What is double buffering? How does openGL support this? Discuss. **(06 Marks)**

c. Enlist the features of a good interactive program. **(06 Marks)**

4 a. Explain the mathematical entities – point, scalar and vector with examples for each. **(06 Marks)**

b. How do you model a cube? Write a function "Cube" which models and renders a $2 \times 2 \times 2$ cube. **(10 Marks)**

c. Explain Bilinear interpolation method of assigning colors to points inside a quadrilateral. **(04 Marks)**

PART – B

5 a. Explain the basic affine transformations in 3D along with their matrix forms. **(08 Marks)**

b. How does instance transformation help in generating a scene? Explain. **(06 Marks)**

c. Explain openGL transformation matrices along with their syntax. **(06 Marks)**

6 a. List the differences between perspective projection and parallel projection. **(04 Marks)**

b. Derive the matrices for simple perspective projection and orthogonal projection. **(08 Marks)**

c. Explain the perspective projection and parallel projection along with their openGL functions. **(08 Marks)**

7 a. Explain Phong lighting model. **(08 Marks)**

b. How does openGL support different light sources? Discuss. **(06 Marks)**

c. How does openGL support different material specifications? Discuss. **(06 Marks)**

8 a. What is clipping? Explain Cohen-Sutherland line-clipping algorithm in 2D. **(06 Marks)**

b. Clip the following polygon using Sutherland-Hodgeman algorithm shown in Fig. Q8 (b). **(06 Marks)**

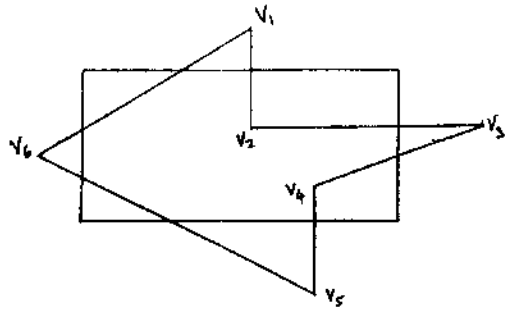

Fig. Q8 (b)

c. Write short notes on:
i) DDA algorithm.
ii) Z-buffer algorithm. **(08 Marks)**

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Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. With a neat diagram, explain the graphics pipeline architecture. **(10 Marks)**

b. What are the openGL API's for handling polygon types, color attributes, viewing and aspect ratio? **(06 Marks)**

c. Briefly explain any two applications of computer graphics. **(04 Marks)**

2 a. What are the graphics functions which give good API support? Briefly explain each of them with example. **(10 Marks)**

b. What are the different approaches of color in open GL? Explain with example. **(10 Marks)**

3 a. List the various features that a good inter active programs should include. Describe an open GL animating inter active program for the rotating square. **(10 Marks)**

b. Explain how an event driven input can be performed for window and keyboard events. **(10 Marks)**

4 a. Briefly explain the order in which frames occurs in open GL pipeline. **(08 Marks)**

b. With respect to modeling of color cube discuss;
i) Vertex array.
ii) Bilinear interpolation.
iii) Data structure for object representation. **(12 Marks)**

PART – B

5 a. What are Affine tranformation? Explain the basic transformation with respect to homogenous co-ordinate system in 3D. **(10 Marks)**

b. What are Quaternion? With an example, explain how Quaternion are used in rotation in a 3D space. Give the mathematical representation of Quaternion. **(10 Marks)**

6 a. What are simple projections? Obtain prespective and orthogonal 4×4 matrix representation. **(10 Marks)**

b. Briefly explain different types of viewing with neat sketches. **(10 Marks)**

7 a. Explain the Phong lighting model. **(10 Marks)**

b. Give the different classification of light material interactions. How are these supported in open GL? **(10 Marks)**

8 a. Explain the Cohen Sutherland line clipping algorithm and perform the clipping for line segment AB = $[(-13,5)(17,11)]$, CD[(-2,3)(1,2)] against the window having lower left corner (-8,-4) and upper right corner at (12,8). **(10 Marks)**

b. Explain the scan line polygon filling algorithm. **(10 Marks)**

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