Computer Graphics and Visualization VTU Question Paper Set

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10CS65
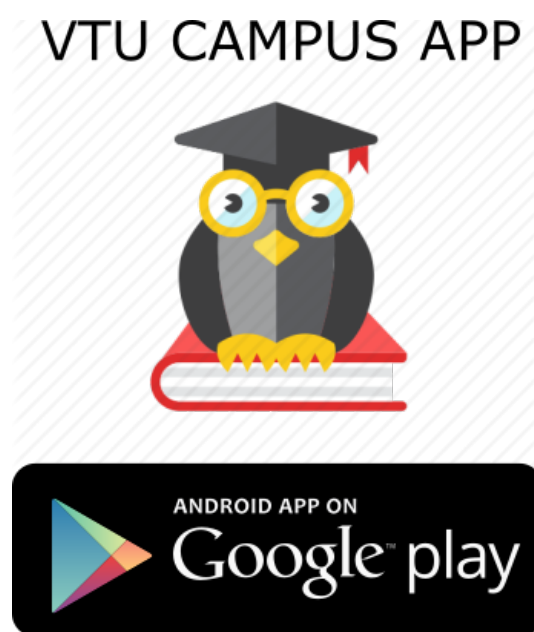
Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Computer Graphics & Visualization

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. 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)**
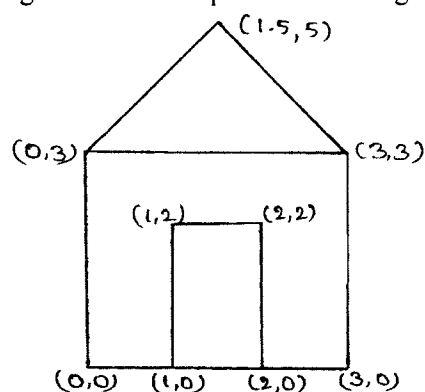

Fig. Q1 (b)

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

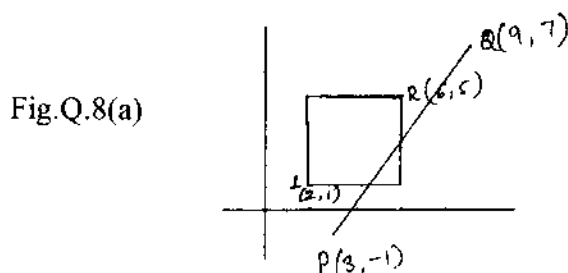Time: 3 hrs.   Max. Marks:100

**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, Dec.2014/Jan.2015
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. 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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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, Dec.2013/Jan.2014
Computer Graphics and Visualization

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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)**

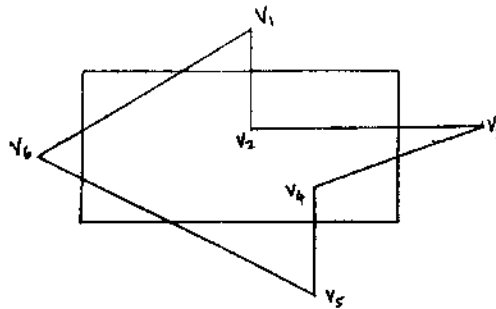b. Clip the following polygon using Sutherland-Hodgeman algorithm shown in Fig. Q8 (b). **(06 Marks)**

Fig. Q8 (b)

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

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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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