Sixth Semester B.E. Degree Examination, June-July 2009
Computer Graphics and Visualization

Time: 3 hrs.   Max. Marks:100
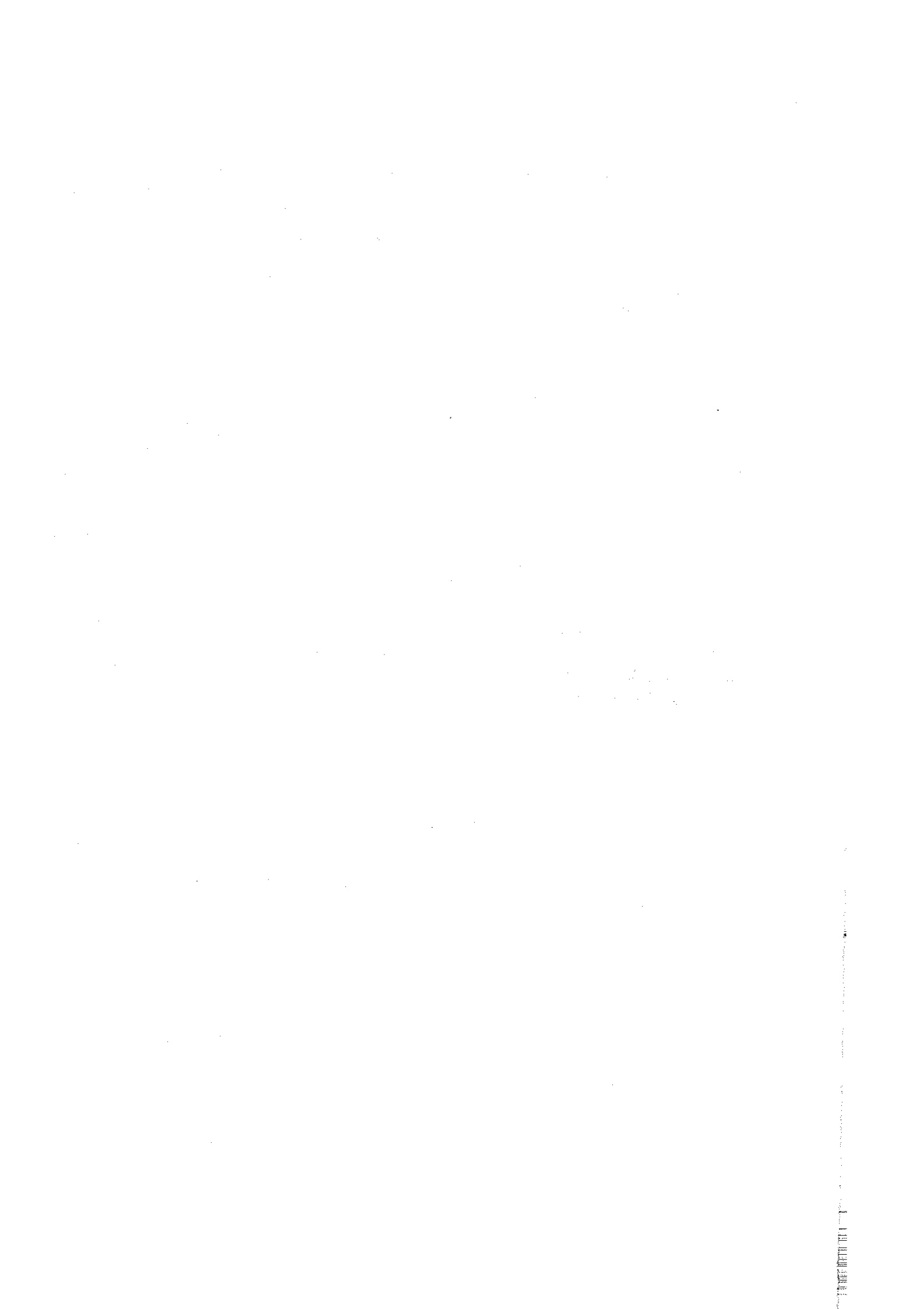
Note: *Answer any FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1 a. Explain the concept of pinhole camera which is an example of an imaging system. Derive the expression for angle of view. Also indicate the advantages and disadvantages of this.
(10 Marks)

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

2 a. Write an Open GL program for a 2 – D Sierpinski gasket using mid – point of each of triangle. Indicate the assumptions made in generating the above.
(10 Marks)

   b. Briefly explain the orthographic viewing with open GL functions for 2 – D and 3 – D viewing. Indicate the significance of projection plane and the viewing point in this.
(10 Marks)

3 a. What are the various classes of logical input devices that are supported by open GL? Explain the functionality of each of these classes.
(09 Marks)

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

   c. Suppose that the open GL window is 500 x 500 pixels and the clipping window is a unit square with the origin at the lower left corner. Use simple XoR drawing mode to draw erasable lines using open GL code. Also elicit as to how the first end points of the object coordinates are obtained and stored.
(07 Marks)

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

   b. With regard to modeling discuss the following:
   i)   Data structures for object representation.
   ii) Bilinear interpolation
   iii) Vertex arrays.
(10 Marks)

PART – B

5 a. Write an openGL program that allows to orient the cube with one mouse button, to translate it with a second and to 200m in and out with a third.
(10 Marks)

   b. What are quaternions? With illustrative example, explain how quaternions are used in rotations in a three – dimensional space. Give the mathematical representations of quanternions.
(10 Marks)

6 a. With neat sketches, explain the various types of views that are employed in computer graphics systems.
(10 Marks)

   b. Briefly discuss the following along with the functions used for the purpose in openGL.
   i) Perspective projections
   ii) Orthogonal projections.
(10 Marks)

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

   b. What are the different methods available for shading a polygon? Briefly discuss any two of them.
(10 Marks)

8 a. Explain the concept of polygon clipping with neat sketches. What is the necessity of it? Can we apply Cohen – Sutherland and Liang – Barsky algorithms for clipping the polygons? If so, how it is done? Explain.
(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, Dec.09/Jan.10
Computers 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. Explain the graphics system, with a diagram. (08 Marks)
    b. With a neat block diagram, explain the graphics pipeline architecture. (12 Marks)

2   a. List out different open GL primitives, giving examples for each. (08 Marks)
    b. Write an open GL recursive program for 3D Sierpinski Gasket, with relevant comments. (12 Marks)

3   a. Differentiate event mode with request mode. (04 Marks)
    b. Describe logical input operation of picking in selection mode. (06 Marks)
    c. Write an open GL program to draw a rectangle and move the rectangle to the need position centered at mouse cursor. (10 Marks)

4   a. List the geometric objects and associated operations in affine space. (06 Marks)
    b. Explain the procedure involved in transforming the world frame to camera / eye frame, with an example. (08 Marks)
    c. How is the affine transformation advantageous in open GL? (06 Marks)

Part – B

5   a. What is a homogeneous co-ordinate system? Using this co-ordinate system, represent all the basic 2D transformations. (12 Marks)
    b. Write an open GL program to rotate a cube about x, y and z axes. Use mouse buttons to select axis of rotation. Use glRotatef( ) function. (08 Marks)

6   a. Derive the projection matrices for perspective viewing. (12 Marks)
    b. Explain gluLookAt function. (04 Marks)
    c. Write a note on hidden surface removal. (04 Marks)

7   a. Give the different classification of light material interactions. How are these supported in open GL? (08 Marks)
    b. Describe Phong Lighting Model. (12 Marks)

8   a. Write Liang Barsky line clipping algorithm. (10 Marks)
    b. Explain Bresenham's line rasterization algorithm. (10 Marks)

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