USN ☐☐☐☐☐☐☐☐☐☐   06CS65

Sixth Semester B.E. Degree Examination, December 2012
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. Briefly explain any six applications of computer graphics.   **(06 Marks)**
    b. Explain the concept of pinhole camera with appropriate diagrams and equations.   **(08 Marks)**
    c. Explain the pipeline architecture in computer graphics.   **(06 Marks)**

2   a. Explain the different types of polygons in OpenGL.   **(07 Marks)**
    b. Write a program in OpenGL to display the following Fig.Q.2(b) on a raster display system. Assume suitable coordinates for the vertices.   **(08 Marks)**
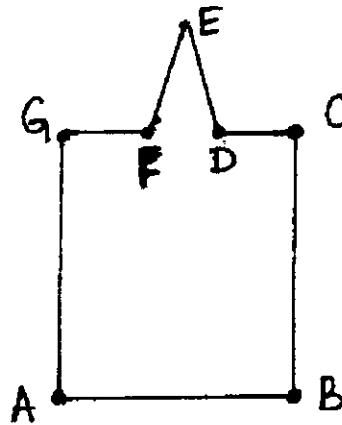

Fig.Q.2(b)

    c. What are two forms of text? Explain.   **(05 Marks)**

3   a. Explain the logical classification of I/O devices with examples.   **(06 Marks)**
    b. How are menus and submenus created in OpenGL? Illustrate with an example.   **(06 Marks)**
    c. Using XOR mode of operation, how are erasable lines drawn in OpenGL. Write OpenGL code and explain.   **(08 Marks)**

4   a. What are the data structures required to define a cube?   **(06 Marks)**
    b. Write the transformation matrices for 2D translation, rotation and scaling and explain.   **(06 Marks)**
    c. What are vertex arrays? Explain how vertex arrays can be used to model a color cube.   **(08 Marks)**

PART – B

5   a. Show that the following sequence commute:
        i)   A rotation and a uniform scaling.
        ii) Two rotations about the origin
        Note: Assume 2D.   **(06 Marks)**

b. In two dimensions, we can specify a line by the equation $y = mx + h$. Find an affine transformation to reflect two dimensional points about this line. **(06 Marks)**

c. Write an OpenGL program to rotate a triangle whose vertices are A(0, 0), B(0, 0), C(5, 10) about the reference point (5, 10) by 45°. Use builtin OpenGL functions for transformations. **(08 Marks)**

6 a. Derive the perspective projection matrix. **(08 Marks)**

b. Explain glFrustum (..) API with syntax. **(08 Marks)**

c. Bring out the differences between object-space algorithms and image space algorithms. **(04 Marks)**

7 a. Explain the different types of light sources in graphics. **(10 Marks)**

b. Explain with code the approximation of a sphere by recursive subdivision. **(10 Marks)**

8 a. Explain the Cohen-Sutherland line clipping algorithm. **(10 Marks)**

b. Explain the Z-buffer algorithm for hidden surface removal. How do you enable the Z-buffer algorithm in OpenGL? **(10 Marks)**

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