Virtual University	**MID TERM EXAMINATION II** **SEMESTER Spring 2005** **CS602-COMPUTER GRAPHICS**	**Total Marks: 35** **Duration:60mins**

StudentID/LoginID	
Name	
PVC Name/Code	
Date	

Maximum Time Allowed: (1 Hour)

Please read the following instructions carefully before attempting any of the questions:

1. Attempt all questions. Marks are written adjacent to each question.

2. Do not ask any questions about the contents of this examination from anyone.

a. If you think that there is something wrong with any of the questions, attempt it to the best of your understanding.

b. If you believe that some essential piece of information is missing, make an appropriate assumption and use it to solve the problem.

c. Write all steps, missing steps may lead to deduction of marks.

****WARNING: Please note that Virtual University takes serious note of unfair means. Anyone found involved in cheating will get an `F` grade in this course.**

For Teacher's use only							
Question	Q1	Q2	Q3	Q4	Q5	Q6	Total
Marks							

Question No 1 **Marks 5**

Choose the most appropriate answer

1. **A Polygon is complex, if the line connecting:**
   a. Any two points outside the polygon intersects its boundary.
   b. Any two points inside the polygon intersects its boundary.
   c. A point inside the boundary with any point outside does not intersect the polygon boundary.
   d. Any two vertices, intersects some edge of polygon.

2. **The equation of hyperbola centered at origin (if the transverse axis is along x -axis) can be given as:**

   a. x2 b2+ y2 a2–1 = 0
   b. x2 b2+ y2 a2+1 = 0
   c. x2 a2– y2 b2–1 = 0
   d. x2 b2 – y2 a2–1 = 0

3. **Which of the following statements is not true about flood-fill and boundary-fill algorithms?**

   a. Both are used for filling of close figure
   b. Both can be implemented as recursive as well as iterative methods
   c. Flood-fill is best for filling of triangle
   d. A complex polygon can be filled with 8 connected approach

4. **Which one is not valid out code to perform trivial accept / reject test in line clipping:**

   a. 1101
   b. 1001
   c. 0101
   d. 0110

5. **Which one of the following is not the graphics library is use:**

   a. FastGL
   b. OpenGL
   c. DirectX
   d. EasyGL

Question No 2 **Marks: 5**

Write the pseudo code to draw an ellipse located at the center **(xc, yc)** (using its polar equations and the angle that the points lying on it make with x axis) such that the length of its semi minor radius is equal to half of its semi major radius take semi major radius of the ellipse as **'a'**.

Solution:

Ellipse (xc, yc, a)

For $\theta = 0$ to $\theta = \pi/2$ step = 1/a
x_ellipse= a * cos θ
y_ellipse= a/2 * sin θ
DrawSymmetricPoints (xc, yc,x_ellipse,y_ellipse)
DrawSymmeticPoints (xc, yc,x_ellipse,y_ellipse)

{

DrawPixel (x_ellipse + xc, y_ellipse + yc) [First Quadrant]
DrawPixel (-x_ellipse + xc, y_ellipse + yc) [Second Quadrant]
DrawPixel (-x_ellipse + xc, -y_ellipse + yc) [Third Quadrant]
DrawPixel (x_ellipse + xc, -y_ellipse + yc) [Fourth Quadrant]
}

Where
semi_major_radius = a
semi_minor_radius = a/2

Question No 3 **Marks: 4+2**

1. **Suppose a man is standing at the point P= (-3,2,3) and it is looking along the vector V = [4,9,11]**
   Determine whether the man would be able to see a point P' (1, 0, 1) or not.
2. **Find the distance between the points (-2,3) and (-6,6)**

Solution:

First we will find Test vector T as follows:
T = [(-3-1),(2-0),(3-1)]
So,
T= [-4,2,2]
Now Finding
T.V = -16+ 18 + 22
= +24
As T.V > 0

Question No 4 **Marks: 6 + 2**

I. **Differentiate between the following:**

   a. **Concave and convex polygons.**
   b. **Complex and concave polygons.**
   c. **Filled and Unfilled Polygons.**

II. **Give the short answers to the following:**

   a. **How we can find that whether a point lies inside a polygon or not?**
   b. **Describe any case in which Boundary fill algorithm may fail.**

Difference between concave and convex polygons

If a straight line connecting any two points that are inside the polygon intersects any edges of the polygon, then this polygon is called Concave polygons, otherwise it will be convex one.

Difference between Complex and Convex polygons

In complex polygons the vertices intersect some edge of the polygon whereas in convex polygons they can not.

Difference between Filled and Unfilled Polygon In an unfilled polygon, only the points on the perimeter of the polygon are drawn. Whereas, in filled polygons all the interior points of the polygon must be filled. This means that all of the pixels within the boundaries of the polygon must be set to the specified color or pattern.

II

a) How we can find that whether a point lies inside a polygon or not?

To test it, draw a line segment from any point that lies outside the polygon to a point P that we wish to determine whether it is inside or outside of the polygon. Count the number of edges that the line crosses. If the number of polygon edges crossed is odd, then P lies within the polygon. Similarly, if the number of edges is even, then P lies outside of the polygon.

b)

The boundary fill algorithm may fail in the case of Complex Polygons.

Question No 5 **Marks: 5+2**

Give the resultant point when we apply 2D scaling using homogenous coordinates on the point P(9,3), about the point P(7,7) Take Sx = 2,Sy = 3.

AS the matrix for scaling with respect to point P(x,y) is

$$\begin{bmatrix} Sx & 0 & (1-Sx)x \\ 0 & Sy & (1-Sy)y \\ 0 & 0 & 1 \end{bmatrix}$$

So the result would be

$$\begin{bmatrix} 2 & 0 & (-1)7 \\ 0 & 3 & (-2)7 \\ 0 & 0 & 1 \end{bmatrix}$$

When we apply it on point P(9,3), we get the result as follows

$$= \begin{bmatrix} 2 & 0 & (-1)7 \\ 0 & 3 & (-2)7 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 9 \\ 3 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 18+0+(-7) \\ 0+9+(-14) \\ 0+0+1 \end{bmatrix}$$

$$= \begin{bmatrix} 11 \\ -5 \\ 1 \end{bmatrix}$$

So our resultant point would be P'(11,-5)

Question No 6 **Marks: 4**

Clearly Explain the Following:

a. **How can we tackle edges meeting at a vertex and for both edges the vertex is the minimum point in scan line filling algorithm.**
b. **In which of planes given below the Point P(2,0,3) lies**
   - **i) xy plane**
   - **ii) yz plane**
   - **iii) zx plane**
c. **Why the Cohen-Sutherland Line-Clipping Algorithm involves much more calculations than the other line clipping algorithms.**

a. **We tackle the edges meeting at a vertex in scan line by incrementing the parity in scan line algorithm twice and filling the point at the vertex.**

b. **ZX plane.**

c. **We need much more calculations in Cohen Stherland line clipping Algorithm because we have to perform trivial accept / Reject test for every point on the line this consumes a lot of computational power and time.**