Thapar Institute of Engineering & Technology, Patiala
MCA 2nd year ,End Semester Examination (10/12/06)
Computer Graphics & Multimedia (CA-014)

Time-3Hr **Marks-36**

*NOTE: Attempt any **four** questions **out of(1-6Q)** each carrying 7 marks . 7th **Q is compulsory** and of 8 marks .Only first five questions attempted will be checked. All parts of a question must be attempted together. Make assumptions if required.*

1. **(a)** What is image processing Describe in brief the major components of the same (2)
   (b) Derive the midpoint algorithm for drawing ellipse. (5)

2. **(a)** Differentiate between random scan displays and raster scan displays (2)
   (b) Give an efficient recursive fill algorithm that substitute the older recursive algorithm for flood fill. (5)

3. **(a)** Explain Sutherland Hodgeman polygon clipping Algorithm. (4)
   (b) Assume we wish to perform a simple perspective projection. Let d be the distance from the view plane z=0 to the center of projection(0,0,-d). Derive the matrix that projects a point p=(x, y, z) as a point p'=(x', y') on the view plane? (3)

4. Given a unit cube with one corner at (0,0,0) and opposite corner at (1,1,1). Rotate the cube by 45 degrees about the main diagonal i.e. from (0,0,0) to (1,1,1) in counter clockwise direction by looking along the diagonal toward the origin. Also give the final matrix. (7)

5. What is B-spline curve? Derive the following B-spline basis matrix M_{Bs} for nonrational, uniform B-Splines having the expression $Q_i(t) = TM_{Bs}G_{Bs,i}$, with vectors T, M_{Bs}, and $G_{Bs,i}$ defined as follows:

$$T = [t^3 \quad t^2 \quad t \quad 1]$$

$$G_{Bs,i} = \begin{bmatrix} P_{i-3} \\ P_{i-2} \\ P_{i-1} \\ P_i \end{bmatrix}$$

$$M_{Bs} = \frac{1}{6}\begin{bmatrix} -1 & 3 & -3 & 1 \\ 3 & -6 & 3 & 0 \\ -3 & 0 & 3 & 0 \\ 1 & 4 & 1 & 0 \end{bmatrix}$$

(7)

6. **(a)**Explain (i) Area subdivision method (ii) Depth Sorting method (4)
   (b) Given a unit surface normal N and light incident from a source in the direction L, show that a vector in the direction of perfect reflector is given by 2(L.N)N-L (3)

7. **a.** What is the use of NDC system (1)
   b. Explain in brief Morphing (1)
   c. Give the differences between parallel and perspective projections? (1)
   d. Give the illumination model including ambient, diffuse and specular components, also draw a picture to show the direction of the vectors in the equation (2)
   e. Define Multimedia. What are the various building blocks of Multimedia (1)
   f. Define the terms: a) Graphics controller b) Color Lookup Table (2)