# ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE - 2009

# COMPUTER GRAPHICS AND MULTIMEDIA

## SEMESTER - 6

Time : 3 Hours ] [ Full Marks : 70

### GROUP - A

### ( Multiple Choice Type Questions )

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) The best hidden surface removal method(s) used for complex scenes with more than a few thousand surfaces is/are

a) Depth sorting method b) Scan line algorithm

c) Depth buffer algorithm d) Octree method. ☐

ii) When the angle between the projectors and the plane of projection is not equal to 90° then the projection is

a) Orthographic b) Isometric

c) Perspective d) Oblique. ☐

iii) Under a parallel projection the point ( 2, 3, – 1 ) has been viewed at ( 3, 3, 0 ), then the direction of the vector should be

a) ( 1, 1, 0 ) b) ( 1, 0, – 1 )

c) ( 0, 1, 1 ) d) ( 0, – 1, 1 ). ☐

iv) The reflection matrix of a point $P(x, y)$ about the straight line $y = -x$ is

a) $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ b) $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$

c) $\begin{bmatrix} -1 & 0 \\ -1 & 0 \end{bmatrix}$ d) $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$. ☐

v) The DDA algorithm is a faster method for calculating pixel positions than direct use of line equation using $y = mx + c$, because

a) it eliminates floating point addition

b) it eliminates floating point multiplication

c) it eliminates rounding operation that drift away from true line path

d) none of these. ☐

vi) In Bresenham's circle algorithm, if points are generated from 90° to 45° and $(x, y)$ are the coordinate of last scan converted pixel then the next pixel coordinate is

a) $(x + 1, y + 1)$ or $(x - 1, y - 1)$

b) $(x + 1, y)$ or $(x, y + 1)$

c) $(x, y + 1)$ or $(x + 1, y - 1)$

d) $(x + 1, y)$ or $(x + 1, y - 1)$. ☐

vii) Aliasing means

a) Rendering effect b) Shading effect

c) Staircase effect d) Cueng effect. ☐

viii) Sutherland-Hodgeman algorithm is used for

a) line clipping b) point clipping

c) polygon clipping d) hybrid clipping. ☐

ix) The technique of using a minimum number of intensity levels to obtain increased visual resolution is

a) Dithering b) Half toning

c) Depth-Cueing d) Rendering. ☐

x) Z-buffer algorithm is used for

a) frame buffer removal b) hidden line removal

c) rendering d) animation.

xi) The format for storing digital audio in multimedia applications is

a) JPEG b) TIFF

c) WAV d) BMP.

xii) The people of the planet Mars designed a scale for measuring the temperature in which water freezes at 100 units and boils at 250 units. The people of Jupiter designed a scale in which water freezes at 75 units and boils at 300 units. A temperature of 200 units in Mars will measure ..... units in Jupiter.

a) 300 b) 225

c) 250 d) 175.

xiii) The Model Human Processor is comprised of three components, which are

a) Cognitive system, perceptual system, and affective system

b) Cognitive system, proprioceptive system and affective system

c) Perceptual system, motor system and cognitive system

d) Perceptual system, locomotion system and cognitive system.

xiv) A raster colour display processor supports a resolution of 1024 × 800 with up to 16 million colours simultaneously displayable. What will be the approximate size ( in bytes ) of the frame buffer used in the display processor ?

a) $1{\cdot}2 \times 10^6$ b) $2{\cdot}4 \times 10^6$

c) $16 \times 10^6$ d) $10^5$.

xv) A Bezier cubic curve with control points $P_0$, $P_1$, $P_2$ and $P_3$ is defined by the equation

$$f(u) = \sum_{i=0}^{3} P_i B_i^3(u).$$

$B_2^3$ is

a) $(1-u)^3$ b) $u^3$

c) $3u(1-u)^2$ d) $3u^2(1-u)$.

## GROUP – B

### ( Short Answer Type Questions )

Answer any *three* of the following questions. $3 \times 5 = 15$

2. Explain antialiasing. A cubic Bezier Curve Segment is described by the control points *P*1 ( 20, 20 ), *P*2 ( 40, 80 ), *P*3 ( 80, 80 ), *P*4 ( 90, 50 ). Another curve segment is described by *Q*1 ( *a*, *b* ), *Q*2 ( *c*, 20 ), *Q*3 ( 150, 20 ), *Q*4 ( 180, 20 ). Determine the values *a*, *b*, *c* so that the two curve segments join smoothly. 2 + 3

3. Perform a 30° rotation of a triangle *A* ( 2, 2 ), *B* ( 3, 3 ), *C* ( 6, 5 ) about

a) the origin

b) a point *P* ( – 8, – 5 ). 2 + 3

4. Define projection and mention its importance. Derive the transformation matrix for a perspective projection.

5. Write the steps of the *Z*-buffer algorithm. Discuss its advantages and disadvantages.

6. What do you mean by staircase effect ? How does this staircase effect affect the generation of graphic primitives ? What was the proposed solution to this effect ?

7. Distinguish between window and viewport. Describe how window to viewport mapping is done.

## GROUP – C

### ( Long Answer Type Questions )

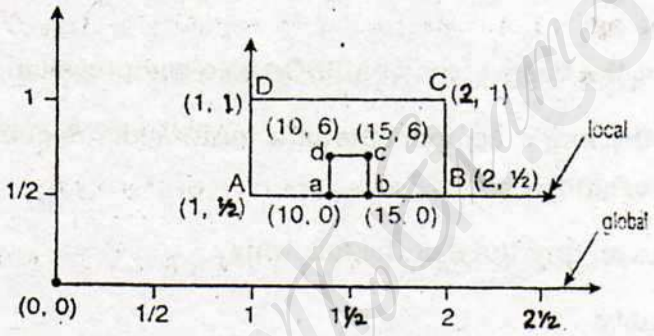
Answer any *three* of the following questions. $3 \times 15 = 45$

8. a) Why are homogeneous coordinates used for transformation computations in Computer Graphics ?

   b) Show how reflections in the line $y = x$ and in the line $y = -x$ can be performed by a scaling operation followed by a rotation.

   c) Describe how a 3D object is presented on the screen using perspective projection. Take a simple object for illustration.

   d) An object "ABCD rectangle" is defined with respect to a coordinate system whose units are measured in inches. If a local coordinate system which uses mm as the basic unit is used to describe the object details "*abcd* rectangle" as shown in the figure below, then indicate the necessary transformation matrix for describing the object in the local coordinate system :




$2 + 4 + 4 + 5$

9. a) Differentiate between Flood Fill & Boundary Fill algorithms.

   b) A Bezier curve is to be drawn by the given control points as *P*1 ( 40, 40 ), *P*2 ( 10, 40 ), *P*3 ( 60, 60 ) & *P*4 ( 60, 0 ). Calculate the coordinates of the points on the curve corresponding to the parameter $t = 0{\cdot}2, 0{\cdot}4, 0{\cdot}6$. Show the rough sketch of the curve with the coordinates of various points on it.

   c) Using mid-point circle drawing algorithm, draw a circle with radius of 8 units.

$4 + 5 + 6$

10. a) What are meant by Key framing and Tweening ?

b) What are Hypertext and Hypermedia ?

c) What is the difference between the following ?

i) Video and Motion picture

ii) Video and animation.

d) What are meant by luminance and chrominance ? Discuss about their quantitative expressions. 3 + 2 + 5 + 5

11. a) Write the mid-point ellipse drawing algorithm ( only the algorithm ).

b) Derive the mid-point circle drawing algorithm.

c) Using mid-point circle drawing algorithm, draw a circle with radius 10 units.

6 + 6 + 3

12. a) What do you mean by *B*-Spline curve ? Discuss the properties of *B*-Spline curves.

b) Write down the basic steps of MPEG video compression.

c) What are the major components of a multimedia document ? How can they be compiled together ? ( 2 + 4 ) + 6 + 3

13. Write short notes on any *three* of the following : 3 × 5

a) Virtual Reality

b) Sampling & Quantization

c) MPEG & JPEG

d) Sutherland-Hodgeman Polygon Clipping Algorithm

e) Phong's Shading Model

f) Cubic B-Spline.

END