WEST BENGAL UNIVERSITY OF TECHNOLOGY

CS-604B

COMPUTER GRAPHICS

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
All symbols are of usual significance.

GROUP A
(Multiple Choice Type Questions)

1. Answer *all* questions. $10 \times 1 = 10$

(i) After arbitrary 2D transformation, a pair of parallel lines

(A) become intersecting
(B) become coincident
(C) remain parallel
(D) become circular arcs

(ii) The matrix representation of reflection about $y = -x$ is

(A) $\begin{matrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{matrix}$

(B) $\begin{matrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{matrix}$

(C) $\begin{matrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{matrix}$

(D) $\begin{matrix} 0 & -1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{matrix}$

(iii) In view-port clipping of 3D viewing, the region code contains _____ number of bits

(A) 6 (B) 4

(C) 5 (D) 7

(iv) If X_L, X_R, Y_B, Y_T represent the four parameters of x-left, x-right, y-bottom and y-top of a clipping window and (x, y) is a point inside the window then

(A) $X_L \leq x \leq X_R$ and $Y_B \leq y \leq Y_T$ (B) $X_L \leq x \leq X_R$ and $Y_B \geq y \geq Y_T$

(C) $X_L \geq x \geq X_R$ and $Y_B \leq y \leq Y_T$ (D) $X_L \geq x \geq X_R$ and $Y_B \geq y \geq Y_T$

(v) CMY coordinates of a color at (0.2, 1, 0.5) in the RGB space are

(A) (1.2, 2, 1.5) (B) (2.2, 2, 2.5)

(C) (0.8, 0, 0.5) (D) (0.1, 0.5, 0.25)

(vi) If (x, y, h), $h \neq 0$, is a point in the homogenous co-ordinate system then its equivalent in the two dimension system is

(A) $(x, y, 1)$ (B) $(x, y, 0)$

(C) $(x/h, y/h)$ (D) $(x, y, x + y)$

(vii) When projection lines are perpendicular to the view plane then such type of projection is called

(A) Parallel (B) Perspective

(C) Orthographic (D) Oblique

(viii) Which of the following is not a hidden surface removal algorithm?

(A) Depth sort (B) Painter's algorithm

(C) Z-buffer (D) None of these

(ix) In raster scanning system, the screen is scanned

(A) top to bottom and right to left (B) left to right and top to bottom

(C) bottom to top and left to right (D) bottom to top and right to left

(x) An object is viewed by using perspective transformation. The maximum number of principal vanishing point(s) possible is

(A) 1 (B) 2

(C) 3 (D) infinite

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

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GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

   i) The orthographic projections have the projectors where

      a) the direction of these projectors is parallel to the view plane

      b) the direction of these projectors is perpendicular to the image plane

      c) the direction of these projectors is perpendicular to the view plane

      d) the direction of these projectors is parallel to the image plane.

ii) The blending functions of Bezier curves are
   a) Splines
   b) Bernstein polynomials
   c) Lagrangian polynomials
   d) Newton polynomials.

iii) In Breshenham's circle algorithm, if points are generated from 90° to 45° and (x, y) are the coordinates 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) $(x+1, y+1)$ or $(x+1, y-1)$
   d) $(x+1, y)$ or $(x+1, y-1)$.

iv) The term that is not synonymous with 'vector CRT' is
   a) Calligraphic CRT b) Raster CRT
   c) Stroke-writing CRT d) Random-scan CRT.

v) A monitor can display 4 shades of red, 8 shades of blue and 16 shades of green. The colour depth supported by the monitor is
   a) 7 bits b) 8 bits
   c) 9 bits d) 10 bits.

vi) If X_L, X_R, Y_B, Y_T represent the four parameters of x-left, x-right, y-bottom, y-top of the clipping window respectively and (x, y) is a point inside the window then
   a) $X_L \le x \le X_R$ and $Y_B \le y \le Y_T$
   b) $X_L \le x \le X_R$ and $Y_B \ge y \ge Y_T$
   c) $X_L \ge x \ge X_R$ and $Y_B \le y \le Y_T$
   d) $X_L \ge x \ge X_R$ and $Y_B \ge y \ge Y_T$.

vii) Resolution can be defined by
   a) number of small square boxes
   b) number of pixels
   c) number of pixels per unit length
   d) none of these.

viii) The viewing transformation is formed by
   a) Translations
   b) Translation and Scaling
   c) Translation, Scaling and Translation
   d) Translation, Scaling and Rotation.

ix) For the scan-line polygon fill algorithm, each horizontal edge should be
   a) ignored
   b) treated as a single intersection point
   c) treated as two intersection points
   d) treated as one or two intersection points, depending on the adjacent vertices.

x) Line end point codes of 4 lines are given below. Which one of the following is totally invisible ?
   a) 1010, 0110 b) 0000, 0000
   c) 1001, 0000 d) 0001, 0100.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) A 24-bit plane colour frame buffer with three 10-bit wide colour look up table can have ..... number of possible colours.

a) 2^{24} b) 2^{8}

c) 2^{48} d) 2^{30}.

ii) 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) 16×10^{6} d) 10^{5}.

[Turn over

iii) 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.

iv) If 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) (0, 1, 1)

c) (0, – 1, 1) d) (1, 0, – 1).

v) The amount of memory in frame buffer is called

a) bit plane

b) plane

c) bit

d) none of these.

vi) Another name of supersamping is

a) post filtering

b) aliasing

c) anti-aliasing

d) none of these.

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

a) Depth sorting method

b) Depth buffer algorithm

c) Scan line algorithm

d) Octree method.

viii) 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.

ix) The slope of the Cubic Bezier curve at the start of the curve is controlled by

a) first control point

b) first two control points

c) first three control points

d) all four control points.

x) A projection in which all three foreshortening factors are kept equal is called as

a) Isometric projection

b) Diametric projection

c) Trimetric projection

d) none of these.

xi) The video memory that is used to hold the image displayed on screen is known as

a) Display processor b) LUT

c) Frame buffer d) Display file.

xii) In Bresenham's circle algorithm, if points are generated from 90° to 45° and (x, y) are the coordinates of last scene 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 $(x+1, y-1)$.

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Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternative for *any ten* of the following:

(i) Refreshing on raster scan display is carried out at the rate of

(a) 60-80 frames/sec (b) 30-60 frames/sec

(c) 40-60 frames/sec (d) None of these

(ii) 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) $\begin{bmatrix} 0 & -1 \\ 0 & -1 \end{bmatrix}$

(iii) Bresenham's line drawing is superior to DDA because

(a) it does not require floating point arithmetic. (b) no round-up is required.

(c) both (a) and (b) (d) it is easily computable.

(iv) Sutherland-Hodgeman algorithm is used for

(a) line clipping (b) point clipping

(c) polygon clipping (d) hybrid clipping

(v) Physical Aspect Ration is termed as

(a) ratio of width of the frame to its height
(b) ratio of width of pixel to its height
(c) ratio of width of block to its height
(d) All of these

(vi) Run length coding is used for

(a) image smoothening
(b) image compression
(c) image colouring
(d) image dithering

(vii) A line with end point codes as 0000 and 0000 is

(a) partially invisible
(b) completely visible
(c) trivially visible
(d) completely invisible

(viii) 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

(ix) According to Lambert's law

(a) the reflection of light from a perfectly diffusing surface varies as the cosine of the angle between the normal to the surface and the direction of the reflected ray.
(b) the reflection of light from a perfectly diffusing surface varies as the sine of the angle between the normal to the surface and the direction of the reflected ray.
(c) Both (a) and (b)
(d) None of the above

(x) The points that control the shape of the curve are known as

(a) Knots
(b) Medians
(c) Modes
(d) None of these

(xi) The memory area which holds a set intensity values for all the screen points is

(a) frame buffer
(b) refresh RAM
(c) video cache
(d) RAM

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

(a) Dithering
(b) Depth-cues
(c) Half-toning
(d) Rendering

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GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) Bresenham's Algorithm seeks to select the optimum raster locations that represent a

   a) straight line b) curve line

   c) polygon d) none of these.

   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) Bresenham's line drawing is superior to DDA because

a) it does not require floating point arithmetic

b) no round-up is required

c) both (a) & (b)

d) it is easily computable.

iv) Clipping algorithms are

a) two or three dimensional

b) two dimensional

c) three dimensional

d) none of these.

v) Physical Aspect Ratio is termed as

a) Ratio of width of the frame to its height

b) Ratio of width of pixel to its height

c) Ratio of width of block to its height

d) All of these.

vi) 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.

vii) The Blending functions of Bezier curves are

a) Splines

b) Bernstein polynomials

c) Lagrangian polynomials

d) Newton polynomials.

viii) Disadvantage of DDA is

a) Round of error

b) Substraction error

c) Addition error

d) both (a) and (b).

ix) Aliasing means

a) Rendering effect

b) Shading effect

c) Staircase effect

d) Cueng effect.

x) 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 $(x + 1, y - 1)$.

xi) An object is viewed by using perspective transformation. The maximum number of principal vanishing point(s) possible in pointer addressable memory is

a) 1 b) 2

c) 3 d) none of these.

xii) 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.