



BRAINWARE UNIVERSITY

Course – MCA

Computer Graphics (MCA402)

(Semester – 4)

Time allotted: 3 Hours

Full Marks : 70

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Question)

10 x 1 = 10

1. *Choose the correct alternative from the following*

(i) Dragging in computer graphics can be achieved by which of the following transformation?

- | | |
|----------------|----------------------|
| a. Translation | b. Rotation |
| c. Scaling | d. Mirror reflection |

(ii) When the angle between the projection and the plane of projection is not equal to 90^0 then the projection is

- | | |
|-----------------|--------------|
| a. Orthographic | b. Isometric |
| c. Perspective | d. Oblique |

(iii) How many number of pixels will be put on for the line starting at (1, 1) and ending at (12, 7) if line is drawn using DDA algorithm?

- | | |
|-------|-----------------|
| a. 7 | b. 11 |
| c. 12 | d. more than 12 |

- (iv) If you rotate the point (20,30) by 90 degrees anticlockwise and then translate it by (-20,0) and then scale it by (2,1), where will the point be?
- | | |
|---------------|--------------|
| a. (100, -20) | b. (100, 10) |
| c. (-100, 20) | d. (100, 20) |
- (v) Interlacing
- | | |
|--|--|
| a. refer to mixing shades on the graphics screen. | b. refers to displaying alternative columns on the screen. |
| c. refer to displaying alternative rows on the screen. | d. is another term for refreshing the screen. |
- (vi) In Cohen Sutherland line clipping algorithm, if the codes of the two points P & Q are 0101 & 0001 then the line segment joining the point P & Q will be
- | | |
|----------------------|------------------|
| a. fully invisible | b. fully visible |
| c. partially visible | d. none of these |
- (vii) In Bresenham's circle algorithm, if points are generated from 90^0 to 45^0 and (x, y) is the coordinate 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) |
- (viii) Resolution for a display device can be defined by
- | | |
|---|--------------------------------------|
| a. Height and width of device. | b. number of small square boxes |
| c. number of pixels on the horizontal axis and the number of pixel on the vertical axis | d. number of pixels per unit length. |

- (ix) The method which used either delta x or delta y, whichever is larger, is chosen as one raster unit to draw the line this algorithm is called
- a. DDA Line Algorithm
 - b. Midpoint Line Algorithm
 - c. Bresenham's Line Algorithm
 - d. Generalized Bresenham's Algorithm
- (x) A scaling transformation changes the
- a. location of an object
 - b. size of an object
 - c. shape of an object
 - d. none of these

Group – B

(Short Answer Type Questions)

3 x 5 = 15

Answer any *three* from the following

2. Describe the meaning of interlaced video and the reason for using interlaced video formats. [5]
3. Rewrite the coordinates of the triangle with vertices A(2,2), B(6,4) & C(3,8), after scaling it three times while keeping F(5,3) fixed. [5]
4. Suppose an RGB raster system is to be designed using an 8 inch × 10 inch screen with a resolution of 100 pixels per inch in each direction. If we want to store 6 bit per pixel in the frame buffer, how much storage in bytes do we need for the frame buffer?
Describe the difference between Raster scan and Random scan. [2+3]
5. Derive the Bresenham's line drawing algorithm mathematically. [5]
6. Derive transformation matrix for rotating a point (x, y) in 2D plane where rotating angle is θ in anticlockwise direction. [5]

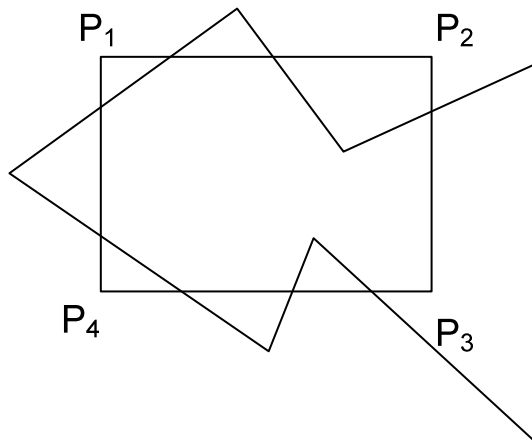
Group – C

(Long Answer Type Questions)

3 x 15 = 45

Answer any *three* from the following

7. (a) A Bezier curve is defined by the ordered control points $P_0(2,1)$, $P_1(3,2)$, $P_2(5,0)$ and $P_3(6, 2)$ with endpoints P_0 , P_3 . Compute any four points (except the given control points) of the Bezier curve. [8]
- (b) Prove that two scaling transformations S_1, S_2 are commutative, i.e. $S_1 S_2 = S_2 S_1$. Prove also that 2D rotation by θ_1 followed by θ_2 is same as a rotation of $\theta_1 + \theta_2$. [7]
8. (a) A triangle is defined by $(20,12)$, $(14,18)$ and $(30,40)$ Find the transformed coordinates after the following transformations :
 i) 45° anti-clockwise rotation about $(2, 3)$.
 ii) Reflection about line $y = -x$. [8]
- (b) Write down the Liang-Barsky line clipping algorithm. [7]
9. (a) What is projection? Compare parallel and perspective projection. [7]
- (b) Use Cohen-Sutherland line clipping algorithm to clip line $P_1(70, 20)$ and $P_2(100, 10)$ against a window lower left hand corner $(50, 10)$ and upper right hand corner $(80, 40)$. [8]
10. (a) Clip the following polygon with respect to the rectangle $P_1P_2P_3P_4$ using Sutherland-Hodgeman algorithm. [10]



- (b) Write short note on Z-buffer algorithm. [5]

11. (a) Derive the midpoint ellipse drawing algorithm mathematically. [10]
(b) Derive the Hermite matrix. [5]