

Total No. of Questions: 6

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Enrollment No.....



Duration: 3 Hrs.

Faculty of Engineering

End Sem Examination May-2023

CS3CO24 / IT3CO25 Computer Graphics & Multimedia  
Programme: B. Tech. Branch/Specialisation: CSE / IT / All

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

- Q.1 i. Which of the following is a correct abbreviation of DDA algorithm? 1  
(a) Data differential analyser (b) Direct differential analyser  
(c) Digital difference analyser (d) Digital differential analyser
- ii. Bitmap is a collection of \_\_\_\_\_ that describes an image. 1  
(a) Pixels (b) Algorithms (c) Bits (d) Colors
- iii. Which of the following is defined as the process of elimination of 1 parts of a scene outside a window or a viewport?  
(a) Editing (b) Cutting (c) Plucking (d) Clipping
- iv. The Cohen-Sutherland algorithm divides the region into how many 1 spaces?  
(a) 9 (b) 8 (c) 7 (d) 6
- v. Among the given scientists/inventor who is known as the father of 1 Computer Graphics?  
(a) Nikola Tesla (b) Ivan Sutherland  
(c) Ada Lovelace (d) Marie Curie
- vi. Which of the following equation is used in 2D translation to move a 1 point(x,y) to the new point (x',y')?  
(a)  $x' = x + ty$  and  $y' = y + tx$  (b)  $x' = x - tx$  and  $y' = y - ty$   
(c)  $x' = x + tx$  and  $y' = y + ty$  (d)  $x' = x + tx$  and  $y' = y - ty$
- vii. Which of the following is a computer-based presentation technique? 1  
(a) Slides (b) Tutorial  
(c) Multimedia (d) Data Processing

P.T.O.

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- viii. How many types of video compressions exist? 1  
(a) 2 (b) 3 (c) 4 (d) 6
- ix. It refers to simulated motion pictures showing movement of drawn objects. 1  
(a) Motion (b) Animation (c) VR (d) SMD
- x. Name of the first animation film. 1  
(a) Humorous Phases of Funny Faces  
(b) Tom and Jerry  
(c) Mickey Mouse  
(d) How I learnt animations
- Q.2 i. Differentiate between the following: 4  
(a) Raster Scan Vs Random Scan  
(b) Beam Penetration Vs Shadow Mask CRT
- ii. Write Bresenham's scan converting line drawing algorithm. Compare it with DDA line drawing algorithm. Consider the line from (5, 5) to (13, 9) use the Bresenham algorithm to rasterize the line 6
- OR iii. Explain midpoint circle algorithm with the help of 8 ways symmetry. 6  
Using midpoint circle algorithm plot circle whose radius scores to 10 unit
- Q.3 i. Explain how Inverse transformation can be performed on an object, also explain homogeneous coordinate system. 4
- ii. Explain in detail the Cohen Sutherland line clipping algorithm with an example. Also explain how code can be find with the help of coordinates. 6
- OR iii. Perform a 45 degree rotation stop triangle A(0,0) B(1,1) C(5,2) 6  
(a) About the origin (b) About point P(-1,-1)
- Q.4 i. Explain ray tracing and state difference between projection and ray tracing. 3
- ii. Describe Parallel & Perspective Projection with their types also write difference between both. 7
- OR iii. Explain various Hidden Surface Elimination techniques with their advantages and disadvantages. 7
- Q.5 i. Define multimedia. What are its characteristics? Also give the uses of multimedia. 4

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- ii. What are the components of multimedia system? In what format are these data stored in a computer? How they are linked with each other? 6
- OR iii. Explain video-video color spaces, digital video, digital video processing and video file formats in detail. 6
- Q.6 Attempt any two: 5
- i. What is an animation? Discuss its applications. Also give animation file formats. 5
- ii. Explain briefly: 5
- (a) Multimedia Databases (b) Lossless/Lossy compression
- iii. Briefly explain MPEG Standards with the advantages and disadvantages of various standards. 5

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## Marking Scheme

### IT3CO25 (T)-Computer Graphics and Multimedia (T)

Q.1 i) Which of the following is a correct abbreviation of DDA algorithm? **d** Digital differential analyzer

ii) Bitmap is a collection of \_\_\_\_\_ that describes an image. **a** pixels

iii) Which of the following is defined as the process of elimination of parts of a scene outside a window or a viewport? **d** clipping

iv) The Cohen-Sutherland algorithm divides the region into how many spaces? **a** 9

v) Among the given scientists/inventor who is known as the father of Computer Graphics?

**b** Ivan Sutherland

vi) Which of the following equation is used in 2D translation to move a point(x,y) to the new point (x',y')?

**c**  $x' = x + tx$  and  $y' = y + ty$

vii) Which of the following is a computer based presentation techniques ?

**(C) Multimedia**

viii) How many types of video compressions exist?

**(A) 2**

ix) It refers to simulated motion pictures showing movement of drawn objects.

**b** Animation

x) Name of the first animation film.  
**a** Humorous Phases of Funny Faces

Q.2 i. Differentiate between: i) Raster Scan Vs Random Scan

4

ii) Beam Penetration Vs Shadow Mask CRT.

Difference between each 2 marks

ii. Write Bresenham's scan converting line drawing algorithm. Compare it with DDA line drawing algorithm. Consider the line from (5, 5) to(13, 9 ) use the Bresenham algorithm to rasterize the line

Algorithm -1.5 marks

Comparison -1.5 marks

Problem solution -3 marks

OR iii. Explain midpoint circle algorithm with the help of 8 way symmetry. Using midpoint circle algorithm plot circle whose radius scores to 10 unit.

Algorithm -1 marks

Explanation -1 marks

Problem solution -2 marks

Q.3 i. Explain how Inverse transformation can be performed on an object, also explain homogeneous coordinate system.

Definition of each -2 marks

Explanation of each -2 marks

ii. Explain in detail the Cohen Sutherland line clipping algorithm with an example. Also explain how region code can be find with the help of coordinates.

Definition -2 marks

Explanation -2 marks

Formula for region code -2 marks

OR iii. Perform a 45 degree rotation stop triangle A(0,0) B(1,1) C(5,2)  
a) About the origin and b) about point P(-1,-1)

6

6

4

6

-2 marks

-2 marks

-2 marks

6

	problem solution for each	-3 marks	Components Data Storage Linking of multimedia	-2 marks -2 marks -2 marks
Q.4	i. Explain Ray Tracing and state difference between projection and ray tracing.	3	OR    iii. Explain Video-Video Color Spaces, Digital Video, Digital Video Processing and Video File Formats in detail.	6
	Definition	-2 marks	Definition	-2 marks
	Diagram and explanation	-1 marks	Video processing types	-2 marks
	ii. Describe Parallel & Perspective Projection with their types also write difference between both.	7	File formats with explanation	-2 marks
	Definition	-2 marks	Q.6	Attempt any two:
	Types	-3 marks	i.	What is an Animation? Discuss its applications? Give animation file formats
	Difference	-2 marks		Definition of Animation
OR	iii. Explain various Hidden Surface Elimination techniques with their advantages and disadvantages.	7		-1 marks
	Definition	-2 marks	i.	Applications
	Types	-2 marks		-2 marks
	Explanation of each	-1		Animation File formats
	marks		ii.	-2 marks
	Advantages	-1 marks	Explain briefly:	5
	Disadvantages	-1 marks	i) Multimedia Databases	
Q.5	i. Define Multimedia? What are its characteristics? Also give the uses of multimedia?	4	ii) Lossless/Lossy compression	Each 2.5 Marks
	Definition	-2 marks	Definitions each	
	Characteristics	-1 marks	Types / Applications each	
	Uses of Multimedia	-1 marks	iii.	Briefly explain MPEG Standards with the advantages and disadvantages of various standards.
				5
	ii. what are the components of multimedia system? In what format are these data stored in a computer? how they are linked with each other?	6	History of MPEG	-1 marks
			MPEG Standard	-2 marks
			Advantages	-1 marks
			Disadvantages	-1 marks
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Q. ② (ii) Computer Graphics & Multi media 13/5/I

①

$$\Delta x = |13 - 5| = 8$$

$$\Delta y = |9 - 5| = 4$$

$$\begin{matrix} x \\ y \end{matrix} = \begin{matrix} 5 \\ 5 \end{matrix}$$

LT3C025

$$\text{find slope } m = \frac{y_2 - y_1}{x_2 - x_1} \Rightarrow \frac{9 - 5}{13 - 5} = \frac{4}{8} = \frac{1}{2}$$

max  $m < L$ ,  $P_0 = 2dy - d/x$

$$P < 0$$

$$x_{i+L} = x_i + 1$$

$$y_{i+L} = \text{No change}(y_i)$$

$$P_i = P_0 + 2dy$$

$$\left. \begin{array}{l} P > 0 \\ x_{i+L} = x_i + 1 \\ y_{i+L} = y_i + 1 \\ P_i = P_0 + 2dy - 2dx \end{array} \right\}$$

$$P_0 = 2dy - dx = 2 \times 4 - 8 = 0$$

By following the above table

$$x_{i+L} = x_i + L = 5 + L = 6$$

$$y_{i+L} = y_i + L = 5 + 1 = 6$$

$$P_{i+L} = 0 + 2 \times 4 - 2 \times 8 = 8 - 16 = -8$$

$$P_{i+L} = -8 < 0$$

$$x_{i+L} = x_i + L = 6 + L = 7$$

$$y_{i+L} = y_i = 6$$

$$P_{i+L} = -8 + 2 \times 4 = 0$$

$$P > 0$$

$$x_{i+L} = 8$$

$$y_{i+L} = 7$$

Similarly we can complete the points as shown <sup>(2)</sup>

P	$x_i$	$y_i$	$x_{i+L}$	$y_{i+L}$
0	5	5	6	6
-8	6	6	7	6
0	7	6	8	7
-8	8	7	9	7
0	9	7	10	8
-8	10	8	11	8
0	11	8	12	9
-8	12	9	13	9

Q(2)(iii)

$$\text{Given } r = 10 \quad x=20 \quad y=1 \\ \text{Centre} = (0,0) \quad y=10$$

$$P_0 = 1-r = \boxed{d_{i0} = 1.25 - 1}$$

$$P_0 = 1-r = \boxed{-9 < 0}$$

$$\text{case 1} = d_{i0} < 0$$

then

$$\text{rect}(x_{i+L}, y_i)$$

$$\boxed{d_{i+L} = d_i + 2x_{i+L} + 1}$$

$$\text{case 2}$$

$$d_i > 0 \\ (x_{i+L}, y_{i+1})$$

$$\boxed{d_{i+L} = d_i + 2x_i + 1 - 2y_i}$$

~~case 3~~

$$x_{i+1} = x_i + L = 1$$

$$y_{i+1} = y_i = 10$$

$$d_{i+1} = d_i + 2x_{i+1} + 1 = -9 + 2 \times 1 + 1 = -6 < 0$$

$$\begin{aligned}
 d_{i+2} &= d_i + 2x_i + l - 2y_i & \textcircled{3} \\
 &= 6 + 2 \times 4 + l - 2 \times 9 = 6 + 9 - 18 = -3 < 0 \\
 d_{i+1} &= d_i + 2x_i + l = -3 + 2 \times 5 + l = 8 > 0 \\
 d_{i+2} &= d_i + 2x_i + l - 2y_i \Rightarrow 8 + 2 \times 6 + l - 2 \times 8 \\
 d_{i+2} &= d_i + 2x_i + l - 2y_i \Rightarrow 8 + 13 - 16 = 5
 \end{aligned}$$

$d_i$	$x_{i+}$	$y_{i+}$	$x_{i+1}$	$y_{i+1}$
-9	0	10	l	10
-6	l	10	2	10
-1	2	10	3	10
6	3	10	4	9
-3	4	9	5	9
8	5	9	6	8
5	6	8	7	7

φ ③ iii)

The composite matrix should be written from

origin right to left

$(T(x)) \times (R(\Theta_x)) \times (T(-x))$  and NOT  $(T(-x)) \times R(\Theta_x) \times T(x)$

The composite rotation matrix could be =

$$\begin{bmatrix} l & 0 & -(l) \\ 0 & l & -(l) \\ 0 & 0 & l \end{bmatrix} \begin{bmatrix} \cos(\alpha) & -\sin(\alpha) & 0 \\ \sin(\alpha) & \cos(\alpha) & 0 \\ 0 & 0 & l \end{bmatrix} \begin{bmatrix} l & 0 & -(l) \\ 0 & l & -(l) \\ 0 & 0 & l \end{bmatrix}$$

Translation

Rotation matrix

Translation

Substitute the vector and rotation angle

?  $= 5x + 10y - 10z - 15$

multiply the resultant reference matrix with the triangle(4)

matrix

$$\begin{bmatrix} \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} & -L \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & (2/\sqrt{2})-1 \\ 0 & 0 & L \end{bmatrix} \begin{bmatrix} A & B & C \\ 0 & 1 & 5 \\ 0 & 1 & 2 \\ 1 & 1 & L \end{bmatrix}$$

resultant component matrix

Triangle matrix

$$\begin{bmatrix} A' & B' & C' \\ 1 & -1 & (3/\sqrt{2})-1 \\ (2/\sqrt{2})-1 & (4/\sqrt{2})-1 & (9/\sqrt{2})-1 \\ 1 & 1 & 1 \end{bmatrix}$$

② respect to origin

$$\begin{bmatrix} A & B & C \\ 0 & L & 5 \\ 0 & L & 2 \\ 0 & 0 & L \end{bmatrix} \begin{bmatrix} \cos\varphi & \sin\varphi & 0 \\ \sin\varphi & \cos\varphi & 0 \\ 0 & 0 & L \end{bmatrix}$$

put the value

$$\begin{bmatrix} \cancel{A} & \cancel{B} & \cancel{C} \\ 0 & L & 5 \\ 0 & L & 2 \\ 0 & 0 & L \end{bmatrix} \times \begin{bmatrix} 1/\sqrt{2} & -1/\sqrt{2} & 0 \\ 1/\sqrt{2} & 1/\sqrt{2} & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 0 & L & 5 \\ 0 & L & 2 \\ 0 & 0 & L \end{bmatrix}$$

multiply

$$= \begin{bmatrix} 0 & 0 & 3/\sqrt{2} \\ 0 & 2/\sqrt{2} & \cancel{1}/\sqrt{2} \\ 0 & 0 & 1 \end{bmatrix}$$

$A'(0,0)$ ,  $B'(0, 2\sqrt{2})$  and  $C'(3\sqrt{2}, 2\sqrt{2})$  Ans