**BCA 6th Semester - Computer Graphics Q&A**

# Group B (2023)

# (a) Types of software in Computer Graphics (2 marks):

# 1. Design Software – Used for creating and editing graphics (e.g., Adobe Photoshop, CorelDRAW).

# 2. Modeling Software – Used for creating 3D models (e.g., Blender, Autodesk Maya).

# 3. Rendering Software – Converts models into realistic images (e.g., V-Ray, Arnold).

# 4. Animation Software – Used to create animated sequences (e.g., Adobe After Effects).

## Differentiate between Interactive and Non-Interactive computer graphics.

**Interactive graphics allow user input to modify visuals.**

**Non-interactive graphics display static content without user control. Example: Games (interactive), Digital posters (non-interactive).**

## Explain about Trackball.

**Trackball is an input device with a ball that rotates in place.**

**The user rolls the ball to control pointer movement on the screen. Commonly used in 3D modeling and CAD applications.**

1. **Write advantages of computer graphics. Enhances data visualization and user interfaces. Used in gaming, animation, and virtual reality. Supports simulations and design processes.**
2. **Differentiate between flood fill and boundary fill algorithm. Flood fill spreads color from a point to neighboring pixels of same color. Boundary fill spreads until it hits a specified boundary color.**

**Flood fill uses region color; boundary fill uses edge color.**

## Define odd-parity method.

**Draw a horizontal line from the point and count polygon edge crossings. If the count is odd, the point lies inside the polygon.**

**Used for filling complex polygon shapes.**

## What is Homogenous Scaling.

**Changes object size using matrix multiplication with extra coordinate. Supports uniform or non-uniform scaling in 2D/3D.**

**Scale factor zero collapses the object to a point.**

## Explain Area Clipping.

**Removes parts of objects outside a clipping window. Ensures only visible portions are processed and displayed. Improves rendering performance.**

## What is Shearing?

**Distorts object shape by shifting points in one direction. Shifts coordinates proportionally along X or Y axis.**

**Used for creating italic or skewed effects.**

## Define Non-zero winding method.

**Counts how many times polygon winds around a point. If winding number is not zero, point is inside.**

**Works well for complex and concave polygons.**

## 

## Group-B (2024)

## a) What is the use of electron gun in CRT?

## In a CRT (Cathode Ray Tube), the electron gun is used to emit a stream of electrons.

## These electrons are accelerated and directed towards the phosphor-coated screen.

## When they hit the screen, they produce visible light to form images.

## b) Write two advantages of Computer Graphics.

## Computer Graphics makes complex data visualization easy and interactive.

## It enhances user interfaces in applications and games.

## It also allows simulation, modeling, and animation in engineering and design fields.

## c) Explain about Trackball.

## A trackball is an input device that contains a movable ball on its surface.

## The user rotates the ball with fingers to move the cursor on the screen.

## It is often used in laptops and specialized computer systems like CAD workstations.

## d) How is the size of the object changed for scaling factor = 1, > 1, and < 1?

## If the scaling factor = 1, the object remains the same size.

## If the scaling factor > 1, the object is enlarged.

## If the scaling factor < 1, the object is reduced in size.

## e) Define "ODD-PARITY" method.

## Odd parity is an error detection technique in binary communication.

## It ensures the total number of 1s in the data is odd.

## If it is not odd, a parity bit is added to make it odd.

## f) State Flood filling algorithm.

## Flood fill is an algorithm used to fill a connected region with a color.

## It starts from a seed pixel and spreads to neighboring pixels.

## The algorithm continues until it encounters boundaries or different colors.

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## g) What is Homogenous Scaling?

## Homogeneous scaling uses transformation matrices in homogeneous coordinates.

## It allows uniform scaling in all directions using matrix multiplication.

## This makes scaling easier to combine with other transformations like rotation and translation.

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## h) Define 2D Shearing.

## 2D shearing is a transformation that shifts the shape of an object along one axis.

## It changes the object's shape without altering its size.

## It is applied using shear matrices along x or y axis.

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## i) Define Hardcopy Device.

## Hardcopy devices are output devices that produce physical prints of digital content.

## Examples include printers and plotters.

## They are used for documentation, graphics, and engineering drawings.

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## j) What is Clipping?

## Clipping is a process of removing parts of graphics outside a defined region.

## Only the portion within the viewport or clipping window is displayed.

## It is commonly used in computer graphics for rendering scenes efficiently.

## Group-C 2024

## a) Explain the functions of CRT.

## CRT (Cathode Ray Tube) displays images by directing electron beams onto a phosphor screen.

## It has functions like image display, resolution handling, and color control.

## CRT also supports fast screen refresh rates which are useful for animations and video display.

## b) Write a short note on Beam Penetration Method.

## Beam Penetration Method is used to display color in CRT monitors.

## It involves controlling the depth of electron beam penetration into different phosphor layers.

## This method usually displays 4 basic colors – red, green, yellow, and orange.

## c) Explain Successive Decision Parameter in Bresenham's algorithm.

## In Bresenham's line drawing algorithm, the decision parameter decides which pixel to plot next.

## The "successive decision parameter" helps in reducing floating point operations.

## It updates the decision variable based on the previous pixel’s location using simple addition.

## 

## d) Mention homogeneous matrix form of 3D Reflection.

## The homogeneous matrix for 3D reflection depends on the plane across which reflection happens.

## For example, reflection across the XY-plane is done using the matrix:

## [1 0 0 0]

## [0 1 0 0]

## [0 0 -1 0]

## [0 0 0 1]

## It helps to flip objects in 3D space.

## e) state 2d rotation in computer graphic?

## 2D Rotation in Computer Graphics:

## 2D rotation is a transformation used to rotate an object in a 2D plane about a fixed point (usually the origin).

## The position of each point (x, y) is changed using rotation formulas involving sine and cosine.

## The rotation formulas are:

## x' = x·cosθ - y·sinθ

## y' = x·sinθ + y·cosθ

## Here, θ is the angle of rotation in degrees or radians. Positive θ means counterclockwise rotation.

## 

## f) Explain in brief about Interactive Computer Graphics.

## Interactive Computer Graphics allows users to interact directly with graphical elements on screen.

## It includes systems like drawing tools, games, CAD applications, etc., where input devices like a mouse or keyboard are used.

## The feedback is immediate, making it user-friendly and more responsive than non-interactive graphics.

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## h) Differentiate between Window Port and Viewport.

## A Window Port is a selected area in the world coordinate system that we want to display.

## A Viewport is the corresponding area on the device (like screen) where the window content is mapped.

## The window defines what to show, and the viewport defines where and how big to show it on screen.

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## i) Given a circle C with radius 10 and centre (1, 4). Apply the translation with distance 5 towards X-axis and 1 towards Y-axis. What are the new coordinates of C without changing its radius?

## Original center: (1, 4)

## Translation: +5 (X-axis), +1 (Y-axis)

## New center = (1+5, 4+1) = (6, 5)

## Radius remains unchanged = 10

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## j) Given a square with coordinate points A(0,3), B(3,3), C(3,0), D(0,0). Apply the translation with distance 1 towards X axis. What is the new coordinates of the square?

## Translation along X = +1

## New points will be:

## A = (0+1, 3) = (1,3)

## B = (3+1, 3) = (4,3)

## C = (3+1, 0) = (4,0)

## D = (0+1, 0) = (1,0)

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## k) Given a 3D object with coordinate points A(0,3,3), B(3,3,6), C(3,0,1), D(0,0,0). Apply the scaling parameter 2 towards X axis, 3 towards Y axis and 3 towards Z axis and obtain the new coordinates of the object.

## Scaling factors: X = 2, Y = 3, Z = 3

## Apply scaling to each point:

## A(0,3,3) → (0×2, 3×3, 3×3) = (0,9,9)

## B(3,3,6) → (3×2, 3×3, 6×3) = (6,9,18)

## C(3,0,1) → (3×2, 0×3, 1×3) = (6,0,3)

## D(0,0,0) → (0×2, 0×3, 0×3) = (0,0,0)

## 

**GROUP C**

**(a) Explain the function of CRT?**

**CRT stands for Cathode Ray Tube and displays images on a screen. Electron beams are aimed at a phosphor-coated surface to create visuals. Phosphors glow when struck, forming the image frame by frame.**

**Continuous refreshing maintains a stable display.**

## Write a short note on Shadow mask method.

**Used in color CRTs to ensure accurate color reproduction.**

**A metal mask with holes aligns electron beams with RGB phosphors. Beams pass through holes to hit correct color dots on the screen.**

**Prevents color bleeding and improves image clarity.**

## Write the matrix form of 3D Reflection by using Homogenous coordinate.

**Reflection flips object coordinates over a specified plane. To reflect over the XY plane, invert the Z coordinate values. Matrix: [1 0 0 0; 0 1 0 0; 0 0 -1 0; 0 0 0 1].**

**Used for creating mirrored objects in 3D.**

## Write the matrix form of 2D rotation by using Homogenous coordinate.

**Rotation turns points about the origin by angle theta.**

**Matrix: [cos(theta) -sin(theta) 0; sin(theta) cos(theta) 0; 0 0 1]. Preserves object shape while changing orientation.**

**Combines easily with other transformations.**

## Explain any two applications of computer graphics.

**Used in engineering CAD for designing structures and components. Vital in entertainment for movies, games, and animations.**

**Applied in medical imaging like CT scans and MRI visualization. Helps education through interactive simulations.**

1. **Differentiate between Window Port and View Port. Window is the selected region in world coordinate space. Viewport is the display area on the output device.**

**Window-to-viewport mapping converts world to screen coordinates. Enables zooming and panning features.**

## Explain about viewing pipeline.

**Transforms 3D object data into a 2D display image.**

**Includes stages: modeling, viewing, projection, clipping, display. Projects 3D coordinates onto a 2D plane for rendering.**

**Allows different camera views and perspectives.**

1. **Write the attributes of Graphics primitives. Defines visual properties of points, lines, and polygons. Line attributes include style, width, and color.**

**Fill attributes include pattern, style, and color. Text attributes include font, size, and orientation.**

1. **What is the main disadvantage of DDA Algorithm? Uses floating-point calculations, which are slower to execute. Prone to rounding errors when plotting pixel positions.**

**Requires more computation than Bresenhams integer method. Less suitable for high-performance real-time graphics.**

## Difference between 2D Transformation and 3D Transformation.

**2D transforms involve X and Y axes only.**

**3D transforms include Z axis for depth dimension.**

**2D uses 3x3 matrices, 3D uses 4x4 homogeneous matrices. 3D supports perspective projection and depth handling.**