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**MCA**  
**(SEM IV) THEORY EXAMINATION 2024-25**  
**COMPUTER GRAPHICS AND ANIMATION**

**TIME: 3 HRS****M.MARKS: 100****Note:** Attempt all Sections. In case of any missing data; choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Q No.	Question
a.	How do Raster Scan Displays work
b.	What is frame buffer? What is the role of a Video Controller?
c.	Write short note on Back Face Detection algorithm,
d.	List the operating characteristics for the following display technologies: raster refresh systems and vector refresh systems.
e.	List some applications appropriate for Plasma and CD display technologies
f.	Consider three different raster systems with resolutions of 640 x 480, 1280 x 1024 and 2560 x 2048. What size is frame buffer (in bytes) for each of these systems to store 12 bits per pixel?
g.	Write the basic geometric transformations
h.	Find the transformation that scales (with respect to origin) by simultaneously a units in the X direction and b units in the Y-direction.
i.	What are difference(s) between Gouraud and Phong shading?
j.	What is meant by anti aliasing? Write two methods used to develop anti aliasing routines.

**SECTION B****2. Attempt any three of the following:****10 x 3 = 30**

Q No.	Question
a.	Derive the expression for the line having slope greater than 1 ( $m > 1$ ) i.e. the line lies in second octant, using Bresenham's line drawing algorithm. Approximate the intermediate points on the line between the points (2, 3) to (5, 10).
b.	Magnify the triangle with vertices A(0,0), B(1,1) and C (5,2) to twice its size while keeping C(5,2) fixed.
c.	Obtain the expression of composite transformation matrix for rotation about an arbitrary axis in space.
d.	What do you understand by z-buffer algorithm?
e.	What are different types of CRT display devices? Write its disadvantages

**SECTION C****3. Attempt any one part of the following:****10 x 1 = 10**

Q No.	Question
a.	An arbitrary shaped polygon in 2-D has been transformed, the transformation matrix T have the parameters a, b, c, d. Prove that the overall area of the transformed structure is equal to the area of old polygon multiplied by determinant of this matrix (i.e. the existing area multiplied by the determinant of transformation matrix will give the area of the transformed or the new structure.)
b.	Define tilting as rotation about the x-axis followed by the rotation about the y-axis a) Find the final matrix after tilting b) Does the order of performing the rotation matter?

**4. Attempt any one part of the following:****10 x 1 = 10**

Q No.	Question
a.	Obtain the general form of matrix for reflection about a line L having slope m and y intercept c. The matrix should be expressed in terms of slope of the line i.e. m.
b.	Use the Cohen Sutherland algorithm to clip line P1 (70,20) and p2(100,10) against a window lower left hand corner (50,10) and upper right hand corner (80,40).



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**TIME: 3 HRS****M.MARKS: 100****5. Attempt any one part of the following: 10 x 1 = 10**

Q No.	Question
a.	Define the following terms in coordinate system: i) Screen Coordinates ii) World Coordinates iii) Window iv) Viewport. Find the transformation matrix that maps the window in world coordinates to the viewport in screen coordinates.
b.	Explain Bezier curves, their mathematical formulation, properties, and limitations.

**6. Attempt any one part of the following: 10 x 1 = 10**

Q No.	Question
a.	Triangle is defined by $\begin{pmatrix} 2 & 4 & 4 \\ 2 & 2 & 4 \end{pmatrix}$ Find the transformed coordinates after the following transformation (i) 90° rotation about origin. (ii) Reflection about line $y = -x$ .
b.	Explain the concept of blobby objects in computer graphics. How do they model organic shapes, and what mathematical principles are used?

**7. Attempt any one part of the following: 10 x 1 = 10**

Q No.	Question
a.	Prove that simultaneous shearing in both direction (X & Y direction) is not equal to the composition of pure shear along x-axis followed by pure shear along y-axis.
b.	What are the fundamental principles, elements of animations, and their usage ?