NATIONAL INSTITUTE OF TECHNOLOGY JAMSHEDPUR

Department of Computer Science and Engineering

Odd Mid Semester Examination-2024

MCA (2nd Year): 3rd Semester
Course Name: Computer Graphics

Course Code: CS3304
Time: 02 Hour
Max. Marks: 30

Name of Faculty: Dr. Amit Majumder

Note: Attempt all the questions. Assume suitable missing data if any.

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1. A) What are the differences between Random Scan Display and Raster Scan Display? Consider the line from (2, 3) to (6, 9). Apply DDA algorithm to calculate the pixels on the line. What is the limitation of DDA algorithm? [1+3+1]

   B) Assuming $0 < m \leq 1$ (m=slope of a line), derive decision parameter for Mid-Point method of line drawing algorithm and then write the algorithm. [5]

2. A) Consider a triangle with vertices A(1, 1), B(3, 2) and C(7, 3). Find out the transformation matrix to magnify the triangle with scale factor of 2 in X-direction and 2 in Y-direction, keeping C(7, 3) fixed. What will be the vertices of the triangle after applying the transformation? [5]

   B) A line whose end points are (3, 6) and (5, 8) is to be rotated about a fixed point (2, 4) by an angle 45^0 counter-clockwise. Using matrix operations find the coordinates of the end points after rotation. [5]

3. A) Using Cohen-Sutherland Line Clipping algorithm, find the clipping coordinates for a line P_1P_2 with end points P_1=(30, 20) and P_2=(280, 160) against a window with lower left corner (70, 60) and upper right corner (230, 150). [5]

   B) How will you determine whether a point is inside or outside a polygon? How does the Scan-line algorithm work to fill a polygon? [2+3]

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Department of Computer Science and Engineering
END SEMESTER EXAMINATION DECEMBER -2024

MCA (2nd Year): 3rd Semester
Course Name: Computer Graphics

Course Code: CS3304
Time: 03 Hour
Max. Marks: 50

Name of Faculty: Dr. Amit Majumder

Note: Attempt all the questions. Assume suitable missing data if any.

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1. A) Suppose we have a square ABCD with vertices A(1,1), B(3,1), C(3,3), D(1,3) and the centre at (2,2). It is desired to scale the square by a factor of 0.5 along x-axis and 0.5 along y-axis with the centre of square still remaining at the same position. Find out a single transformation matrix to achieve this. Also find the resultant coordinates of the square after applying the transformation. [5]

B) Suppose a point is to be rotated in 3-dimensional space by an angle θ about an arbitrary axis defined by a line between two points $P_1=(x_1,y_1,z_1)$ and $P_2=(x_2,y_2,z_2)$. What are the steps to find the transformation matrix for this transformation? Find the transformation matrices for each of these steps. [5]

2. A) Considering 4 control points $P_0(1,1)$, $P_1(2,3)$, $P_2(4,3)$ and $P_3(6,4)$ find out the parametric equation (say, parameter t) for Bezier curve of order 3 and then find out the three points on the curve at $t=\frac{1}{4}$, $t=\frac{1}{2}$ and $t=\frac{3}{4}$. [5]

B) How does flood-fill algorithm work to fill a polygon? [5]

3. A) Distinguish between image space method and object space method for detecting hidden surfaces. Discuss Binary Space Partitioning (BSP) tree method for hidden surface removal. [1+4]

B) Explain briefly the Z-buffer algorithm. What is the limitation of the Z-buffer algorithm? [4+1]

P.T.O