## **Question Paper**

Exam Date & Time: 19-May-2022 (10:00 AM - 01:00 PM)

MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL (A constituent unit of MAHE, Manipal)

VI Semester End Semester Examination Computer Graphics VI (ICT 4033)

**COMPUTER GRAPHICS [ICT 4033]** 

Marks: 50

Duration: 180 mins.

**Descriptive Questions** 

## Answer all the questions.

Section Duration: 180 mins

1)		Given the centre point coordinates (10, 10) and radius as 10, generate all the points to form a circle using Bresenham's Circle Drawing Algorithm. Show all intermediate steps.	(5)
	A)		
	B)	Given a homogeneous point (1, 2, 3). Apply rotation 90 degree towards X, Y and Z axis and find out the new coordinate points.	(3)
	C)	Find the normalization transformation window to viewport, with window lower left corner at (1,1) and upper right corner at (3,5) onto a view port, for entire normalized device screen.	(2)
2)	A)	Find the clipping coordinates for a line $R_1R_2$ where $R_{1=}(10,10)$ and $R_2=(60,30)$ , against clipping window with $(X_{wmin}, Y_{wmin})=(15, 15)$ and $(X_{wmax}, Y_{wmax})=(25, 25)$ . Use the Liang- Barsky algorithm to clip the line and find the intersection point. Show all intermediate steps.	(5)
	B)	Perform a counterclockise 45 degree rotation of a triangle A(2,3), B(5,5), C(4,3) about point (1, 1).	(3)
	C)	Generate all the points between line end points (5,7) and (10,12) using Digital Differential Analyzer (DDA) line drawing algorithm.	(2)
3)		Calculate the points between the starting coordinates (20,10) and ending coordinates (30, 18) using Bresenham's Line Drawing Algorithm. Show all intermediate steps.	(5)
	A)		
	B)	Determine the content of the active edge table to fill the polygon with vertices A(2,4), B(4,6) and C(4,1) for y=1 to y=6.	(3)
	C)	Given a 2D triangle with coordinate points P(2,6), Q(5,7), R(4,9). Apply the reflection on the Y axis and obtain the new coordinates of the object.	(2)
4)		Calculate the points between the starting coordinates (20,10) and ending coordinates (30, 18) using Mid-Point Line Drawing Algorithm. Show all intermediate steps.	(5)
	A)		
	B)	Given a square object with coordinate points $A(0,3)$ , $B(3,3)$ , $C(3,0)$ , $D(0,0)$ . Apply the scaling parameter 2 towards X axis and 3 towards Y axis and obtain the new coordinates of the object.	(3)
	C)	Differentiate between Parallel and Perspective projection. Generate a homogeneous matrix representation for oblique projection.	(2)
5)		Apply the Cohen Sutherland line clipping algorithm to clip the line segment with coordinates (30,60) and (60,25) against the window with $(X_{wmin}, Y_{wmin}) = (10,10)$ and $(X_{wmax}, Y_{wmax}) = (50,50)$ .	(5)

- A)
- B) Apply the shearing transformation to square with A(0,0), B(1,0), C(1,1), and D(0,1) as given below. (3)
  - a. Shear parameter value of 0.5 relative to the line  $Y_{\text{ref}}\text{=-}1.$
  - b. Shear parameter value of 0.5 relative to the line  $X_{ref}$ =-1.
- C) Compare and contrast Gouraud shading and Phong shading.

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(2)