PRESIDENCY UNIVERSITY
BENGALURU

SET-B

SCHOOL OF ENGINEERING
END TERM EXAMINATION –MAY/JUNE 2024

Semester : Semester IV - B.Tech CSE - 2022
Course Code : CSE2066
Course Name : Computer Graphics

Date : JUNE 11-2024
Time : 09.30am to 12.30pm
Max Marks : 100

**Program** : B.Tech. Computer Science and Engineering

Weightage : 50%

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Note: **1. Answer ALL 5 FULL Questions.**
2. Each Full Question carries 20 Marks
3. Scientific and non-programmable calculator are permitted.
4. Do not write any information on the question paper other than Roll Number.

1.a. Define computer graphics and find its main purpose in the field of computer science. **[Knowledge]** | (CO1) | (04 Marks)

1.b. Bresenham's line drawing algorithm is an incremental approach to drawing lines. Explain how Bresenham's line drawing algorithm overcomes the drawbacks of the DDA line drawing algorithm and list the disadvantages of Bresenham's line drawing algorithm. **[Comprehension]** | (CO1) | (06 Marks)

1.c. Apply Bresenham's line drawing algorithm for a line from (20, 5) to (15, 15). Provide detailed steps an calculations, showing how the decision parameters change at each step. **[Application]** | (CO1) | (10 Marks)

or

2.a. List input devices. Show any two input devices role in computer graphics. **[Knowledge]** | (CO1) | (04 Marks)

2.b. With neat diagram, explain Raster scan display technique for CRT monitors. List its advantages and disadvantages **[Comprehension]** | (CO1) | (06 Marks)

2.c. Write the DDA line drawing algorithm steps and use this algorithm to generate a line starting from P1 (14, 11) and ending at P2 (6, 7). **[Application]** | (CO1) | (10 Marks)

3.a. Write a brief overview of polygon clipping stages, with an example. **[Knowledge]** | (CO2) | (04 Marks)

3.b. Describe the Cohen-Sutherland Line Clipping algorithm's region code and write the region code for the points, P1, P2, P3 and P4 for the given clipping window size of $(x_{min}, y_{min}) = (10,10)$ and $(x_{max}, y_{max})=(40,40)$. **[Comprehension]** | (CO2) | (06 Marks)

(40, 40)

P4(20, 36)

P3(3,18)

P2(40, 10)

(10, 10)

P1(5,3)
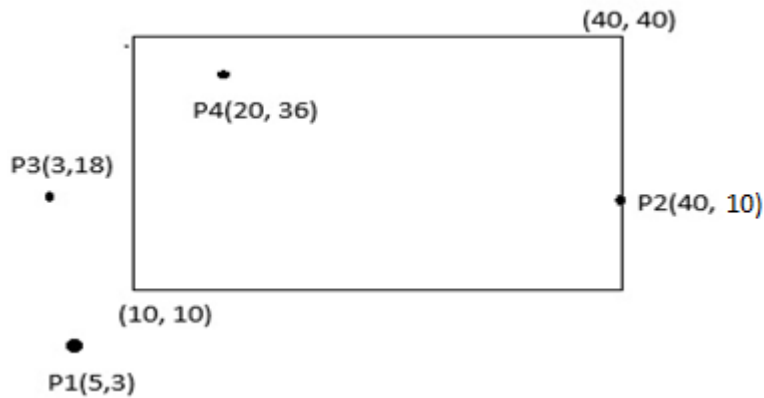
3.c.	Answer the following questions: **[Application]** 1.Identify the transformation steps to transform a point P (Xw, Yw) from the world coordinate system P'(Xv, Yv) in the view coordinate system with a neat diagram. 2.Enlarge the triangle defined by points A (0,0), B (2,3), and C (5,2) to twice its original size while keeping point P (3,3) fixed, using the pivot point scaling approach. Additionally, provide the pivot point scaling matrix.	**(CO2)** (10 Marks)

or

4.a.	Define clipping. List the applications of clipping. **[Knowledge]**	**(CO2)** (04 Marks)
4.b.	Justify why pivot point rotation is a composite transformation and derive the transformation matrix of transformation with a neat diagram. **[Comprehension]**	**(CO2)** (06 Marks)
4.c.	Apply pivot point rotation to rotate the triangle defined by points A (0,0), B (2,3), and C (5,2) by 60degrees about the fixed point p (1,2). And also, write the pivot point rotation matrix. **[Application]**	**(CO2)** (10 Marks)
5.a.	Define the following terms: **[Knowledge]** 1. Vanishing point 2. Foreshortening 3. Canonical View volume 4. DOP	**(CO3)** (04 Marks)
5.b.	Explain Orthogonal Projection with a neat diagram and list down its advantages and disadvantages. **[Comprehension]**	**(CO3)** (06 Marks)
5.c.	An object has 3D coordinates in the X, Y, Z directions as **[Application]** **A** (0, 3, 3), **B** (3, 3, 6), **C** (3, 0, 1), **D** (0, 0, 0) and **E** (5, 5, 5). Apply the transformation in the sequence of translation, rotation, and scaling using the shift vector of (3,4, 2), Rz (45) and scaling factors (2,2,3). Write the	**(CO3)** (10 Marks)

object coordinates after the transformation.

<div align="center">or</div>

6.a.	Find out, how two successive 3D rotations are additive and write the rotation matrix for the same. **[Knowledge]**	(CO3)	(04 Marks)
6.b.	What is a parallel projection? Compare orthographic and oblique projections in detail. **[Comprehension]**	(CO3)	(06 Marks)
6.c.	Explain 3D transformation with the help of examples, covering translation, rotation, and scaling. Discuss their importance in computer graphics. Give examples where each transformation is commonly used **[Application]**	(CO3)	(10 Marks)
7.a	Why is a cubic polynomial suitable for Bezier curve representation? List the advantages of cubic polynomials **[Knowledge]**	(CO4)	(04 Marks)
7.b.	Compare the following: **[Comprehension]** 1.Parametric and non-parametric representation of curve 2.Interpolation and approximation of curve 3.Explicit and implicit representation of curve	(CO4)	(06 Marks)
7.c	Utilize parametric representations to represent of sphere, ellipsoid and torus and write their equations **[Application]**	(CO4)	(10 Marks)

<div align="center">or</div>

8.a	Define spline curve. Explain Interpolation and approximation of curve with diagram. **[Knowledge]**	(CO4)	(04 Marks)
8.b.	Explain Bezier surface with diagram and state the role of control point in shaping the surface. **[Comprehension]**	(CO4)	(06 Marks)
8.c	Given the center point coordinates (-2,2) and radius of 6 units, generate all the points to form a circle using Bresenham's circle drawing algorithm in detail with the algorithm steps. Write the points on the circle in all four quadrants. **[Application]**	(CO4)	(10 Marks)
9.a	What are the main steps involved in the 3D viewing pipeline? **[Knowledge]**	(CO3)	(04 Marks)
9.b	Axonometric projections are a type of parallel projection. Explain different types of Axonometric Projections. **[Comprehension]**	(CO3)	(06 Marks)
9.c	Identify the type of projection for the figures given below and explain it in detail. **[Application]**	(CO3)	(10 Marks)

1.	2.
3.	4.
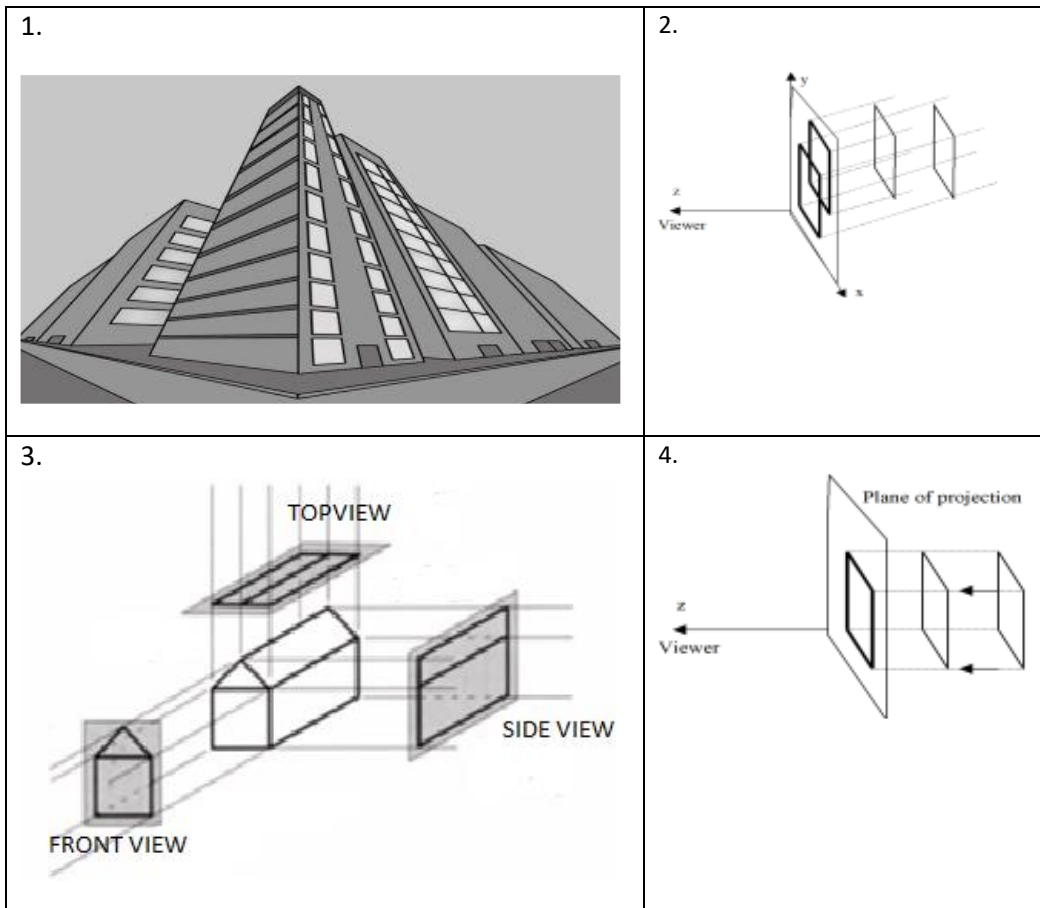
or

10.a Write the degree for the following polynomials. **[Knowledge]** (CO4) (04 Marks)

1. $x^2 + y^2 = 3xy$
2. $x^3 + y^3 = 3xy$
3. $y = mx + c$
4. $xy + 6 = 0$

10.b Explain Spline specification and representation for the given polynomial. **[Comprehension]** (CO4) (06 Marks)

10.c Given the center point coordinates (-2, -3) and radius of 8 units, write the Bresenham's circle drawing algorithm steps and generate all the points to form a circle using the algorithm. Write the points on the circle in all four quadrants. **[Application]** (CO4) (10 Marks)