Reg. No.															

B.Tech/ M.Tech (Integrated) DEGREE EXAMINATION, MAY 2024
Fourth Semester

21CSE255T – COMPUTER GRAPHICS AND ANIMATION
(For the candidates admitted from the academic year 2022-2023 onwards)

Note:
(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours   Max. Marks: 75

PART – A (20 × 1 = 20Marks)
Answer ALL Questions

	Marks	BL	CO	PO

1. Each pixel on the graphics display represents _____ .   [Marks 1, BL 1, CO 1, PO 1]
   - (A) Single mathematical point
   - (B) 2 mathematical point
   - (C) 4 mathematical point
   - (D) A region which theoretically can contain infinite points

2. Line connecting the points (1,1) and (5,3) is to be drawn, using DDA algorithm. Find the value of X and Y increments.   [Marks 1, BL 2, CO 1, PO 2]
   - (A) X-increments = 1; Y-increments = 1
   - (B) X-increments = 0.5; Y-increments = 1
   - (C) X-increments = 1; Y-increments = 0.5
   - (D) X-increments = 0.5; Y-increments = 0.5

3. What will be the starting points for region 2 in Ellipse generating algorithm?   [Marks 1, BL 1, CO 1, PO 1]
   - (A) Points with respect to r_X
   - (B) Last point of region 1
   - (C) (0, 0)
   - (D) (r_X, r_Y)

4. Video devices with reduced volume, weight and power consumption are collectively known as   [Marks 1, BL 1, CO 1, PO 1]
   - (A) Light weight monitors
   - (B) Flat-panel displays
   - (C) CRT
   - (D) Portable display

5. Reflection of a point about X-axis, followed by a counter clockwise rotation of 90°, is equivalent to reflection about the line   [Marks 1, BL 2, CO 2, PO 2]
   - (A) X = –Y
   - (B) Y = –X
   - (C) X = Y
   - (D) X + Y = 1

6. The region code of a point is 1001. The point is in the _____ region of window.   [Marks 1, BL 1, CO 2, PO 1]
   - (A) Top right
   - (B) Top left
   - (C) Bottom left
   - (D) Bottom right

7. Correct scaling factor for window to viewport transformation are   [Marks 1, BL 1, CO 2, PO 1]
   - (A) $S_X = \dfrac{X_{vmax} + X_{vmin}}{X_{wmax} + X_{wmin}}, S_Y = \dfrac{Y_{vmax} + Y_{vmin}}{Y_{wmax} + Y_{wmin}}$

(B) $S_X = \dfrac{X_{vmax} + X_{vmin}}{X_{wmax} - X_{wmin}}, S_Y = \dfrac{Y_{vmax} + Y_{vmin}}{Y_{wmax} - Y_{wmin}}$

(C) $S_X = \dfrac{X_{vmax} - X_{vmin}}{X_{wmax} - X_{wmin}}, S_Y = \dfrac{Y_{vmax} - Y_{vmin}}{Y_{wmax} - Y_{wmin}}$

(D) $S_X = \dfrac{X_{vmax} - X_{vmin}}{X_{wmax} + X_{wmin}}, S_Y = \dfrac{Y_{vmax} - Y_{vmin}}{Y_{wmax} + Y_{wmin}}$

8. Each successive transformation matrix _____ the product of the preceding transformation.   1   1   2   1
   (A) Pre-multipliers   (B) Post-multipliers
   (C) Adds   (D) Subtracts

9. What are the final coordinates after rotation of the point P(5, 5, 5) 90° about Z-axis.   1   2   3   2
   (A) (5, –5, –5)   (B) (–5, 5, 5)
   (C) (–5, –5, –5)   (D) (5, –5, 5)

10. The orthographic projection represents three-dimensional objects in _____.   1   1   3   1
    (A) One dimension   (B) Two dimensions
    (C) Three dimensions   (D) Multidimensions

11. For the Cavalier projection, the direction of projection makes a _____ angle with the view plane.   1   1   3   1
    (A) 45 degree   (B) 40 degree
    (C) 63 degree   (D) 63.4 degree

12. In 3D clipping, which condition in the region code indicates that a point lies near the near-plane of the view frustum?   1   1   3   1
    (A) All bits are set to 0   (B) All bits are set to 1
    (C) The bit corresponding to the   (D) The bit corresponding to the near-
        near-plane is set to 1   plane is set to 0

13. A octree is a data structure which is used for alternative representation of   1   1   4   1
    (A) 2D digital picture or object   (B) 3D picture or object
    (C) Both (A) and (B)   (D) Hidden data

14. In the depth buffer which buffer is/are used?   1   1   4   1
    (A) Depth buffer   (B) Refresh buffer
    (C) Frame buffer   (D) Both (A) and (B)

15. A simple way to model the combination of light reflection from various surfaces to produce a uniform illumination is called   1   1   4   1
    (A) Ambient light   (B) Reflected light
    (C) Background light   (D) Both (A) and (C)

16. Amount of reflected light depends on the parameter _____, which is depending on reflecting property of the surface.   1   1   4   1
    (A) Diffuse reflection coefficient   (B) Ambient reflection coefficient
    (C) Specular reflection coefficient   (D) Any kinds of reflection coefficient

17. What method of animation creates the in-between frames when you create the start and end points of the animation.
    (A) Motion   (B) Classic
    (C) Shape   (D) Tweening

18. In RGB model, number of bits used to represent each pixel is called
    (A) Grey shades in the image   (B) Size of the image
    (C) Pixel depth   (D) Percentage of white color

19. Which color model represents colors as points in a three-dimensional space?
    (A) HIS   (B) HSV
    (C) XYZ   (D) YUV

20. What is the typical range of compression ratios achievable with JPEG compression?
    (A) 1:1 to 2:1   (B) 10:1 to 20:1
    (C) 50:1 to 100:1   (D) 1000:1 to 2000:1

PART – B (5 × 8 = 40 Marks)
Answer ALL Questions

Marks BL CO PO

21. a. Explore two well known methods for generating color displays with a CRT, describing the popularity, effectiveness and underlying principles with in the given constraints.

8 2 1 1

(OR)

b. How do different approaches in boundary fill algorithms determine neighboring pixels for color filling, and what impact to these methods have on the effectiveness of region filling in digital imagery.

8 2 1 1

22. a.i. Given a triangle with coordinates A(2,5), B(7,10) and C(10,2). Apply the translation distance by 3 units in X-direction and 4 units in Y-direction. Obtain the new coordinates with a neat sketch.

4 3 2 2

ii. Scale the polygon with vertices A(2,5), B(10,9), C(7,1) and D(2,2) by a scale factor of 2 units in the X-direction and 2 units in the Y-direction. Provide the new coordinates of the vertices after scaling and illustrate the scaled polygon with a neat sketch for visual clarity.

4 3 2 2

(OR)

b. How does Nicholl-Lee-Nicholl line clipping method enhance line clipping efficiency and precision with in computer graphics and what are its core principles and algorithms?

8 3 2 2

23. a. Describe the concept of perspective projection. which is employed in computer graphics to realistically depict 3D scenes on a flat surface like a computer screen.

8 2 3 1

(OR)

| | | Marks | BL | CO | PO |

b. Discuss how 3D clipping enhances rendering by optimizing visibility management and removing clipped portions, resulting in improved depiction of complex scenes in computer graphics. — 8 2 3 1

24. a. Compare and contrast object space and image space methods for hidden surface removal. — 8 2 4 1

(OR)

b. Describe how the integration of specular reflection within the phong model contributes to enhancing the realism of lighting effects. — 8 2 4 1

25. a. Elaborate the key techniques utilized in animation systems for describing object motions and specifying movement. — 8 2 5 1

(OR)

b. Summarize TIFF's structure and their importance of its tags for image data organization and metadata management? — 8 2 5 1

PART – C (1 × 15 = 15 Marks)
Answer **ANY ONE** Question

Marks BL CO PO

26. You have been tasked with developing a digital drawing tool, and one of your assignments is to implement a feature for drawing symmetrical circles using the midpoint circle algorithm. The circle's center is set at (4,5) with a diameter of 4 units. As you tackle this task, your goal is to systematically walkthrough the steps of the midpoint circle algorithm. Your objective is to calculate the decision parameter at each stage and determine the pixels to be plotted. Its crucial to leverage the circle's symmetry properties to minimize redundancy in pixel calculations. — 15 3 1 2

27. You are developing a graphics application for a Virtual Reality (VR) design platform. In this platform, users can create and manipulate polygons within a virtual environment to design immersive VR experiences. One of the polygons, labeled V_1, V_2, V_3, V_4, V_5 need to be clipped to fit within a specified viewport in the VR environment. Your task is to apply the Sutherland-Hodgeman clipping algorithm to the polygon in the order: LEFT, TOP, RIGHT and BOTTOM. After each side is processed, provide the updated lift of vertices for the clipped polygon and visually display the final result within the viewport. — 15 3 2 2
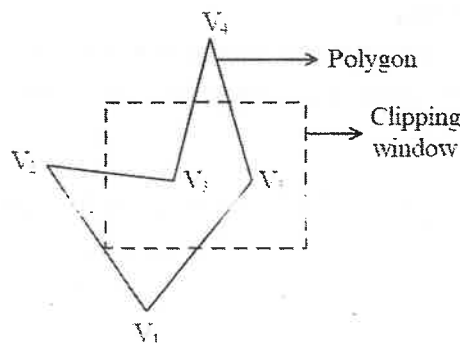
Original polygon with clipping window

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