BSc(H)Computer Science-VISem-2020
Computer Graphics Assignment-I

1 INSTRUCTION:Answer all Questions.

1. What is the advantages of using trigonometric method over polynomial method to generate a circle?

2. Prove that the composition of two successive scaling is multiplicative.

3. Give the relationship between the rotations $R(\theta), R(-\theta)$ and $R(\theta)^{-1}$.

4. What is the basic difference in calculation of decision parameter in Bresenham and mid-point methods.

5. If we want to re-size a 1024×768 image to one that is 640 pixels wide with same aspect ratio, what would be the height of re-sized image?

6. Enumerate various types of light sources, giving one sentence description of each.

7. What is a DVST? What are its advantages and disadvantages over conventional CRTs. Give an example of environment where DVSTs are useful.

8. Derive the general form of a scaling matrix w.r.t. a fixed point $P(h, k)$.

9. Show that the following 2×2 matrix represents a pure rotation.

$$T = \begin{bmatrix} \frac{1-t^2}{1+t^2} & \frac{2t}{1+t^2} \\ \frac{-2t}{1+t^2} & \frac{1-t^2}{1+t^2} \end{bmatrix}$$

10. What are the major adverse side-effects of scan conversion? How these side effects can be removed?

11. Discuss the architecture of the raster display system with integrated display processor.

12. Using mid-point circle drawing algorithm, scan convert the first quadrant of a circle with center at $(0,0)$ and radius of 5 units.

13. How are the partial visible lines determined in Cohen Sutherland algorithm? Give suitable figure.

14. Reflect the diamond-shaped polygon whose vertices are $A(-1,0), B(0,-2), C(1,0), D(0,2)$ about the line $x = 2$.

15. Is there any method to increase the refresh rate in raster display? If yes, then explain it with a suitable diagram.

16. List any five properties of Bezier curve.

17. What are the advantages of Homogeneous coordinate system?

18. What is an image's aspect ratio? If image has a height of 2 inches and an aspect ratio of 1.5. What is its width?

19. What is dithering? Obtain a Dither matrix.

20. What is the composite transformation ? Give suitable example.

21. Derive the basis matrix of a Bezier curve.

22. Show that a $2D$ reflection through the x-axis, followed by a 2D reflection through the line $y = x$, is equivalent to a pure rotation about origin.

23. Find the equation of Bezier curve that passes through $(0, 0)$ and $(4, 2)$ and controlled through $(14, 10$ and $(4, 0)$.

24. A triangle is defined by vertices $(2, 0), (0, 2), (-2, 0)$.It is transformed by 2×2 transformation matrix:

$$T = \begin{bmatrix} 6 & 4 \\ 2 & 4 \end{bmatrix}$$

Find new coordinate of triangle after transformation.

25. Explain Cohen-Sutherland line clipping algorithm and what are the limitations of this algorithm, and how these limitations rectified.

26. Reflect the diamond-shaped polygon whose vertices are $A(-1, 0)$, $B(0, -2)$,$C(1, 0)$, $D(0, 2)$ about the line $x = 2$.

27. Describe the meaning of the following computer graphics terminologies:
    (i) Resolution
    (ii) flickering and burning
    (iii) raster scan line
    (iv) aspect ratio
    (v) frame buffer

28. How are the partial visible lines determined in Cohen Sutherland algorithm? Give suitable figure.

29. Write Bresenham's algorithm and show how it draws a line whose end point is (4,4) and start point is (-3,0).

30. Plot a circle using Bresenham's algorithm whose radius is 3 and center coordinate is (0,0).

31. What is an Anti-aliasing? Why it is used?

32. How aliasing effect can be minimized using resolution in raster display?

33. Enlarge a triangle with vertices $A(1,1)$, $B(5,1)$ and $C(3,5)$ to twice its size.

34. What is the number of memory for a 3-bit plane frame buffer for a 256×256 raster scan system?

35. Briefly explain the interlaced refresh procedure in a raster scan system and its advantage.

36. What are the homogeneous coordinates? Why are they used in computer graphics?

37. Derive the rotational transformation matrix for a $2-D$ system, provided the rotation is performed about origin.

38. What is the geometric vector of a Hermite curve?

39. Use 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 $(80,40)$.

40. Consider the square $A(1,0)$, $B(0,0)$,$C(0,1)$, $D(1,1)$. Rotate the square $ABCD$ by $45^{\deg}$ clockwise about $A(1,0)$.

41. Derive the basis matrix for a Bezier curve. Write any two properties of Bezier curve.

42. What is odd parity rule ?

43. Differentiate between orthographic and oblique projections.

44. Give the difference between Ground and Phong shading.

45. Discuss ways of generating thick primitives.

46. What is oblique projection ? Derive the standard matrix representation for oblique projection onto $Z = 0$ plane.

47. Describe Phong interpolation shading method. What are the merits and demerits of this method?

48. Define the following terms:
    (a) RGB color Model
    (b) Halftoning
    (c) Aspect ratio

49. Write short notes on the following:
    (ii) Multi view orthographic projection.
    (iii) Video mixing function of a video controller

50. What type of animation does a a straight line function $y = mx + c$ produce and why?

51. What are the two data structure used in scan line fill algorithm? Give the structure of each.

52. How can we simulate negative acceleration in animation ? Explain.

53. What is a vanishing point ? How is it computed ?

54. What are the disadvantages of DDA line drawing algorithm ?

55. What is the condition that ellipse scan conversion algorithm uses to divide the first quadrant of the ellipse in two regions ?

56. Write the $3D$ projection matrices for each of the following:
    (i) Orthographic projection on $x = 0$ plane
    (ii)Single point perspective projection with centre of projection on y-axis at $y_c = 2$.
    (iii) Trimetric Projection matrix.

57. Discuss Depth sorting method fr hidden surface elimination. What tests are performed when there is depth overlap?

58. What is Dithering? What is its advantage over half toning?

59. write steps to design an animation sequence.

60. Derive the illumination using Phong specular-reflection model. Include the contribution of diffuse, ambient and specular reflect

61. Explain Shadow mask and beam penetration methods used un raster scan systems to display colors.

62. Indicate which raster locations would be chosen by Bresenham's algorithm when scan-converting a line from screen coordinate (1,1) to screen coordinate (8,5).

63. show that a $2D$ reflection through the x-axis, followed by a $2D$ reflection through the line $y = x$, is equivalent to pure rotation about the origin.

64. A clipping window has two vertices lying at $(0, 0)$ and $(80, 40)$. Use the line end point codes to determine whether the lines $P(40, 20)$, $Q(70, 50)$ and $R(100, 20)$, $S(120, 60)$ would be visible, partially visible or totally invisible.

65. What is RGB color model ? How RGB model represented ?

66. "Simultaneous shearing is not the same as shearing in one direction followed by shearing in another direction". Justify this statement mathematically.

67. How can you compute the depth values Z for a surface position in z-buffer algorithm. Use suitable figure wherever necessary.

68. Consider a parallel projection with the plane of projection having the normal $(1, 0, -1)$ and passing through the origin $O(0, 0, 0)$. Is it orthographic projection? explain your answer with reason.

69. What are the different methods of representing polygon meshes ? Give advantages and disadvantages of each.

70. Discuss the principle of Half ton approximation.

71. How can we simulate negative acceleration in animation? Explain.

72. Write steps to design an animation sequence.

73. Discuss Depth sorting method for hidden surface elimination. What tests are performed when there is depth overlap?

End