

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**SIXTH SEMESTER B.TECH DEGREE EXAMINATION (S), AUGUST 2023
COMPUTER SCIENCE AND ENGINEERING****(2020 SCHEME)****Course Code : 20CST304****Course Name: Computer Graphics and Image Processing****Max. Marks : 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. Differentiate between raster scan and random scan display systems.
2. How 8-way symmetry of circle can be used for writing circle drawing algorithms? Write the symmetric points if (x, y) is a point on the circle with centre at origin.
3. Discuss the significance of homogeneous coordinate system?
4. Given a triangle A(20,10) B(80,20) C(50,70). Find the co-ordinates of vertices after the following transformation:
Rotation of the triangle ABC about vertex A in clockwise direction for an angle 90 degree.
5. Define the terms window, viewport and window to viewport transformation in the context of 2D viewing with suitable diagrams.
6. Explain the need of using vanishing points in projections.
7. Define the following terms:
 - i. 4-adjacency
 - ii. 8-adjacency
 - iii. m-adjacency
8. Explain the different use of sampling and quantization. Give an example to justify your answer.
9. Differentiate between linear and non-linear spatial filters.
10. Describe contrast stretching in spatial domain. What are its applications.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Write Midpoint circle drawing algorithm and use it to plot a circle with radius=10 and center is (50,30). (6)
b) Generate the points between the end points of a line viz.(2,2) and (9,6) by using Bresenham's line drawing algorithm. (8)

OR

12. a) Apply the DDA line drawing algorithm to rasterize a line segment with endpoints (2,8) and (12,18). (8)
b) Explain the working of the random scan display system and draw its architecture diagram. (6)

MODULE II

13. a) Given the position vector for the coordinate ABC as A(4,1), B(5,2) and C(4,3), reflect a triangle ABC about the line $3x-4y+8=0$. (9)
b) Write the boundary fill algorithm for filling a polygon using four connected approach. (5)

OR

14. a) List out the steps involved in scaling a 3D object with respect to a fixed point (x, y, z); and derive the composite transformation matrix. (8)
b) Explain three-dimensional reflection based on zy, xy and xz planes. Also, give the transformation matrices. (6)

MODULE III

15. a) Explain the Sutherland – Hodgeman Polygon clipping algorithm with an example. (9)
b) Discuss, how visible surfaces can be detected using depth buffer algorithm. (5)

OR

16. a) Write the Cohen-Sutherland line clipping algorithm. Use the 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). (10)
b) Distinguish between parallel and perspective projections. (4)

MODULE IV

17. a) What are the components of the image processing system? (7)
b) Explain the process of convolution with an example. (7)

OR

18. a) With a neat diagram, explain the fundamental steps in Digital Image Processing. (7)

- b) Explain in detail the scan line algorithm for visible surface detection (7)
by listing the tables used in this algorithm.

MODULE V

19. a) What is histogram equalization? Also, apply the histogram (8)
equalization method on the following 3-bit image.

$$\begin{bmatrix} 4 & 5 & 4 & 3 \\ 2 & 3 & 2 & 3 \\ 2 & 4 & 5 & 4 \\ 3 & 5 & 4 & 3 \end{bmatrix}$$

- b) Differentiate Prewitt and Sobel edge detectors. (6)

OR

20. a) Describe the following region-based segmentation methods. (8)

- i) Region Growing
- ii) Region Splitting and Merging

- b) Write the following grey level transformation functions. (6)

- i. Log Transformations
- ii. Power-Law Transformations
