Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree Supplementary Examination May 2023 (2019 Scheme)

Course Code: CST304

Course Name: COMPUTER GRAPHICS AND IMAGE PROCESSING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks. Marks

1	List any six applications of Computer Graphics.	(3)
2	Explain the architecture of the raster scan display system.	(3)
3	Differentiate between boundary filling and flood filling algorithms	(3)
4	What are homogenous coordinates and why are they necessary?	(3)
5	Derive the equations of Window to Viewport transformation.	(3)
6	Explain the three dimensional viewing pipeline.	(3)
7	Define the term connected component.	(3)
8	Write short notes on sampling and quantization.	(3)
9	Explain use of the Laplacian filter.	(3)
10	How is intensity thresholding used in image segmentation?	(3)

PART B

Answer one full question from each module, each carries 14 marks.

Module I

11	a)	Derive all the decision parameter equations of the Bresenham's line drawing algorithm with the help of neat labelled diagrams.	(7)
	b)	Plot the line segment joining the pixels with coordinates (-2,-4) and (4,3) using the DDA line drawing algorithm. Show the steps in detail.	(7)

OR

12	a)	Explain the beam penetration and shadow mask method for displaying colour pictures.	(7)
	b)	Plot the circle with centre (5,3) and radius 5 using Bresenham's circle drawing algorithm. Show the steps in detail.	(7)

Module II

13 a) A square in 2D coordinates is specified by its vertices in the order (2,6),(6,6),(6,2), and (2,2). Compute the following transformations, (8)

(i) Rotate the square by 45° about its vertex (2,6)

(ii) Scale the original square by a factor of 2 about its centre

b) Explain the basic 3D transformations using homogeneous coordinates. (6)

OR

14 a) Explain the scan line polygon filling algorithm and the data structures used. (8)

b) Prove that (i) two successive 2D rotations are additive and (ii) two successive 2D scaling are multiplicative. (6)

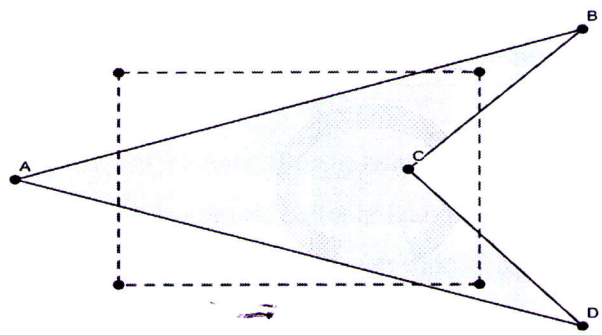
Module III

15 a) Consider the clipping window with vertices in the order (0,0), (0,5), (8,5), and (8,0). Perform clipping of the line segment joining P1(-1,-2) and P2(9,7) using the Cohen-Sutherland line clipping algorithm. Also find the intersection with the clipping window. (6)

b) Explain the different types of projections with taxonomy diagram. (8)

OR

16 a) Apply the Sutherland-Hodgeman algorithm to clip the polygon with respect to the clipping rectangle . (8)



b) Illustrate the working of the Depth Buffer algorithm with the help of an example. (6)

Module IV

17 a) Summarize the fundamental steps in digital image processing with the help of a neat labelled diagram. (8)

b) Differentiate between spatial and gray level resolution. (6)

OR

18 a) Outline the components of an image processing system with the help of a neat labelled diagram. (6)

b) Compute the length of shortest 4,8 and, m-path between pixels p and q in the given figure where V={0,1}. If a particular path does not exist between these pixels, write suitable justification. (8)

Repeat computations using V={1,2}

3	1	2	1 (q)
2	2	0	2
1	2	1	1
(p) 1	0	1	2

Module V

19 a) Explain the following basic intensity transformations : (6)

i) Image Negatives ii) Power law transformation

b) (i) Apply Histogram Equalization method on the following 3-bit image. Also, plot image histogram before and after equalization with detailed steps. (8)

4	3	2	1
5	5	6	6
6	6	7	6
2	3	7	6

OR

20 a) Illustrate the working of the following edge detectors : (8)

i)Sobel ii)Prewitt

b) Explain region splitting and merging segmentation methods using suitable diagrams. (6)

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