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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S, FE) / S4 (PT) (S) Examination January 2024 (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		Suppose you have a raster system designed using an 10 inches × 12 inches screen with a resolution of 100 pixels per inch in each direction. Find the frame buffer size required if 6 bits are used to store one pixel in the buffer?	(3)
2		Compare DDA and Bresenham's line drawing algorithm.	(3)
3		Describe the 2-Dimension basic transformations	(3)
4		Write down 4-neighbour boundary filling algorithm	(3)
5		Discuss on homogeneous coordinate system and specify one significance	(3)
6		Illustrate a window and a viewport in a 2D coordinate system	(3)
7		Describe the steps involved in converting an analog image to a digital image	(3)
8		List out any 3 Applications of image processing in medical field	(3)
9		Discuss on Power-law transformation and its significance in image processing	(3)
10		Differentiate low pass filtering and high pass filtering concept	(3)

PART B

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

Module I

11	a)	Describe the working principle of a Refresh CRT monitor with suitable diagrams	(6)
	b)	Calculate the points between the starting point (9,18) and ending point (14, 22) Bresenham's line drawing algorithm.	(8)

OR

12	a)	Differentiate raster scan display with random scan display. List out the applications of shadow masking techniques used in CRT.	(7)
	b)	Generate all the first and second octant points of a circle using midpoint circle drawing algorithm, given with the centre point coordinates as (0, 0) and radius as 10.	(7)

Module II

13 a) Describe scan-line polygon filling algorithm and illustrate how it manages the special cases. (9)

b) Define shear. Demonstrate x direction shear with an example (5)

OR

14 a) Perform the following transformations on a point (6, 4). (10)

i) Translate by $t_x = -2$ and $t_y = 4$

ii) Then, Scale by $s_x = 2$ and $s_y = 1$

iii) And Rotate by 90^o in clockwise direction. Determine the final coordinates of the transformed point.

b) Describe on composite transformations and show that two successive translations are additive. (4)

Module III

15 a) Write the Sutherland Hodgeman polygon clipping algorithm and explain with an example (8)

b) Show how intersection points are calculated with clipping window boundary in Cohen Sutherland line clipping algorithm. (6)

OR

16 a) Discuss on the types of perspective projections. (6)

b) Describe the scan line algorithm used for visible surface detection (8)

Module IV

17 a) Discuss the steps involved in image processing. Illustrate with an example (8)

b) Discuss on various image classes based on the storage space allocated for pixel intensities. (6)

OR

18 a) Consider an image segment shown below. (8)

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

(i) Let V={1,2} and compute the length of the shortest 4-,8- and m- path between p and q. If a particular path does not exist between these two points, explain why?

b) Define the basic relationships between pixels in an image. (6)

Module V

19 a) Compare and contrast linear and nonlinear filters used in image processing (8)

b) Two images have the same histogram. Which of the following properties must they have in common? Justify your answer. (I is the gray level) (6)

(i) Same total power (sum of squares of pixel values)

(ii) Same Entropy (sum of I ln I over all pixel values)

(iii) Same degree of pixel to pixel correlation?

OR

20 a) Define Image segmentation. Discuss on any three thresholding methods used for segmentation with suitable diagrams. (8)

b) Discuss why spatial differentiation is used in sharpening filters. Discuss the properties of first order and second order derivatives (6)

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