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Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

**Course Code: CS401**

**Course Name: COMPUTER GRAPHICS**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***Answer all questions, each carries 4 marks.*** Marks

| | | |
|---|---|---|
| 1 | What do you understand by the aspect ratio and resolution of a display screen in a raster scan display? | (4) |
| 2 | Write the flood fill algorithm for filling a polygon. | (4) |
| 3 | Write the methods used to plot a dashed line segment. | (4) |
| 4 | Given a triangle A(20,10) B(80,20) C(50,70). Find the co-ordinates of vertices after each of the following transformation.<br>(a) Reflection about the line x=y.<br>(b) Rotation of the triangle ABC about vertex A in clockwise direction for an angle 90 degree. | (4) |
| 5 | Write the different tables used for representing polygon surfaces. Illustrate with an example. | (4) |
| 6 | Describe the techniques that can be used to provide text clipping in a graphics package. | (4) |
| 7 | Explain about different types of parallel projections. | (4) |
| 8 | What do you understand by correlation and convolution operations in case of image processing? | (4) |
| 9 | Write the Z-buffer algorithm for hidden surface removal. | (4) |
| 10 | What do you understand by the following terms with respet to pixels. Neighbours, Adjacency, Connectivity. | (4) |

**PART B**

***Answer any two full questions, each carries 9 marks.***

| | | | |
|---|---|---|---|
| 11 | a) | Explain the working of a random scan display system with suitable diagram. | (6) |
| | b) | Explain the working of a beam penetration CRT. | (3) |
| 12 | a) | Write the midpoint circle drawing algorithm. | (4) |
| | b) | Use midpoint circle drawing algorithm to plot a circle whose radius =20 units and center is (50, 30). | (5) |
| 13 | a) | A mouse is picked up and placed in another position. Whether the position of the mouse pointer change. Justify your answer. | (2) |
| | b) | Explain the working of a light pen. | (3) |
| | c) | Write the scan line algorithm for filling a polygon. | (4) |

## PART C

*Answer any two full questions, each carries 9 marks.*

14 a) Given a clipping window A(-20,-20), B(40,-20), C(40,30) and D(-20,30). Using Cohen Sutherland line clipping algorithm, find the visible portion of the line segment joining the points P(-30,20) and Q(60,-10). (6)

b) Derive an equation for window to viewport transformation by specifying the sequence of basic transformations involved. (3)

15 a) What are the steps for general 3D rotation if the rotation axis is not parallel to any one of the principal axis. The rotation axis is defined by the points P1(x1,y1,z1) and P2(x2,y2,z2). Write down the composite matrix representation. (9)

16 a) Explain Sutherland Hodgeman polygon clipping algorithm with illustrations. (5)

b) Describe the transformation which reflects a 2-D object about a line L which has a y-intercept(0,b) and an angle of intersection theta degree w.r.t. to the x-axis. (4)

## PART D

*Answer any two full questions, each carries 12 marks.*

17 a) Explain in detail the scan line algorithm for visible surface detection by pointing out the data structures used in this algorithm.. (7)

b) How the cyclic overlaps of surfaces are eliminated in scan line algorithm? (2)

c) In case of an A-buffer algorithm, what information is stored in a linked list. (3)

18 a) Explain the fundamental steps in Digital Image Processing with a neat diagram? (8)

b) The gray levels in an image g1(x,y) range from **a** to **b**. It is decided to change it into an image g2(x,y) in which the gray levels range from **c** to **d** using a linear transformation of its gray levels. Derive the equation for g2(x,y) as a function of g1(x,y) by specifying the steps. (4)

19 a) Explain the Robert's, Prewitt's and Sobel's edge detectors. (6)

b) Derive the transformation matrix for perspective projection with the projection reference point at position $Z_{prp}$ along the Zv axis and the view plane at $Z_{vp}$. Write the perspective transformation equations (i) if the view place is taken to be the uv plane (ii) if the projection reference point is taken to be at the viewing co-ordinate origin. (6)

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