Reg No.:_____  Name:_____

## APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Regular and Supplementary Examination December 2021 (2015 Scheme)

**Course Code: CS401**
**Course Name: COMPUTER GRAPHICS**

Max. Marks: 100  Duration: 3 Hours

## PART A
### *Answer all questions, each carries 4 marks.*

| | | Marks |
|---|---|---|
| 1 | Describe the working of a simple random scan display system with suitable diagram. | (4) |
| 2 | For what purpose we use the non-zero winding number rule? How is it used ? Illustrate with an example. | (4) |
| 3 | Rasterize the line segment from pixel coordinate (10, 12) to (15, 15) using Bresenham's line drawing algorithm. | (4) |
| 4 | What do you understand by homogeneous coordinate system? What is its significance? | (4) |
| 5 | Consider a line from P1 to P2 and an arbitrary point P on the line. Prove that after performing some translation the translated P is on the line between the translations of P1 and P2. | (4) |
| 6 | Show how plane equations are used to identify the position of spatial points relative to the plane surface of an object. | (4) |
| 7 | Distinguish between parallel and perspective projections. | (4) |
| 8 | Explain about Orthogonal projections and its types with examples. | (4) |

9

| 2 | 1 | 2 | 3 | 2 |
|---|---|---|---|---|
| 3 | 2 | 2 | 4 | 3 |
| 1 | 3 | 5 | 4 | 3 |
| 3 | 4 | 5 | 6 | 7 |
| 2 | 2 | 6 | 7 | 6 |

(4)

Given a simple image as shown above. Write its frequency table and draw the histogram.

| | | | |
|---|---|---|---|
| 10 | | Explain the steps involved in edge detection. | (4) |

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

| | | | |
|---|---|---|---|
| 11 | a) | With the help of a neat diagram explain the working of a Direct View Storage Tube display. | (5) |
| | b) | Write the difference between emissive and non-emissive flat panel displays with suitable examples. | (4) |
| 12 | a) | Derive the initial decision parameter of midpoint circle drawing algorithm. | (5) |
| | b) | Use mid-point circle drawing algorithm to plot a circle whose radius is 10 units and centre is at (20,10). | (4) |
| 13 | a) | Explain the working of (i) Digital glove (ii) Light pen | (5) |
| | b) | Show how coherence property can be utilised in the calculation of intersection of edges with scan lines in scan line polygon filling algorithm? | (4) |

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

| | | | |
|---|---|---|---|
| 14 | a) | Perform the following transformations on a line with end points A(10, 20) and B(40, 30). Draw the result of each transformation. Apply the second transformation on the result of first and third on the result of second transformation. | (5) |

i) Scale the object two times in x-direction and three times in y-direction.

ii) Rotate the object by 90° Anticlockwise about origin.

iii) Translate one unit in x-direction and two units in y-direction.

| | | | |
|---|---|---|---|
| | b) | Explain how Mid-point subdivision algorithm is used for clipping a line segment. | (4) |
| 15 | a) | | |



(6)
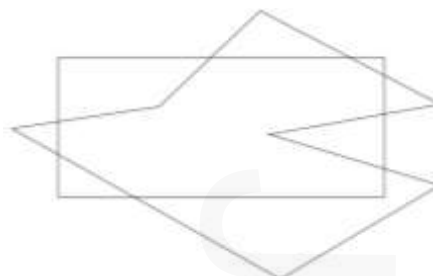
Illustrate the clipping of the polygon shown in figure against the rectangular clipping window using Sutherland Hodgeman algorithm. Draw the intermediate results also.

b) Explain the boundary representation and space partitioning representation schemes used for solid object representation. (3)

16 a) Describe the steps involved in scaling a 3D object with respect to a fixed point (xf, yf, zf). Write the composite transformation matrix. (4)

b) Given a clipping window A(10,-20), B(80,-20), C(80,20) and D(10,20). Using Cohen Sutherland line clipping algorithm, clip the line segment joining the points P(-20,10) and Q(70,-20). Find the end points of the visible portion. (5)

## 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. (8)

b) Distinguish between Cavalier and Cabinet projections. (4)

18 a) With a neat block diagram explain the fundamental steps in image processing. (7)

b) Consider the image segment and compute the length of the shortest 4- , 8- and m-path between p and q by considering two set of values for V: (5)

(i) V={0,1} (ii)V={1,2}. If a particular path does not exist explain the reason for the above two cases of V .

$$
\begin{array}{cccc}
\text{(q) } 1 & 1 & 2 & 3 \\
0 & 2 & 2 & 1 \\
1 & 1 & 0 & 2 \\
2 & 1 & 2 & 1 \text{ (p)}
\end{array}
$$

19 a) Derive a transformation matrix for oblique parallel projection. (6)

b) What do you understand by histogram equalization of an image? Illustrate with suitable example show how equalization is done by dividing the list. (6)

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