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53 (CS 604) CPGR

2014

COMPUTER GRAPHICS

Paper : CS 604

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

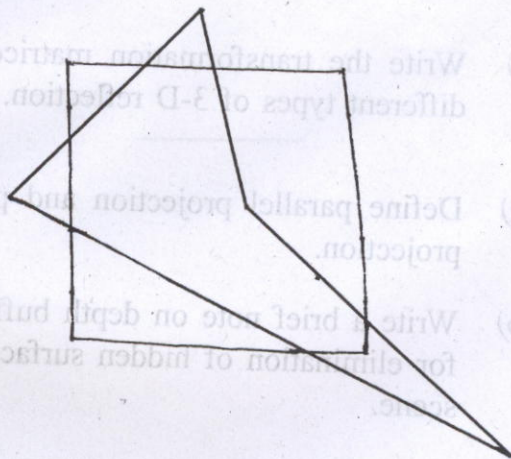
Answer any five questions out of seven.

1. (a) State the Bresenham's algorithm for drawing a straight line. 6
- (b) Plot a circle centered at the origin having a radius of 10 units using midpoint circle algorithm. 6
- (c) Plot an ellipse centered at (0, 0) in the first quadrant with $r_x = 8$ and $r_y = 6$ using midpoint ellipse algorithm. 8

Contd.

2. (a) What do you mean by 2-D geometric transformation? Explain the 2-D rotation of an object from one position to another through an angle θ . 2+5=7
- (b) What is homogeneous coordinate representation? 2
- (c) Define shearing transformation. Explain briefly the various types of shearing transformations. 2+9=11
3. (a) Perform a 45° anticlockwise rotation of a triangle $A(0, 0)$, $B(1, 1)$, $C(5, 2)$ about an arbitrary point $(-1, -1)$. 5
- (b) Reduce the triangle $P(0, 0)$, $Q(1, 1)$ and $R(5, 2)$ to one third its size while keeping $R(5, 2)$ fixed. 5
- (c) Derive the transformation matrix for reflection of an object about an arbitrary line $y = mx + c$. 10
4. (a) Explain in brief 2-D viewing pipeline. 8

- (b) A clipped window $PQRS$ has bottom left corner at $(3, 4)$ and upper right corner at $(10, 9)$. Find the section of the clipped line AB [$A(2, 11)$ and $B(11, 7)$] using Cohen-Sutherland line clipping algorithm. 6
- (c) Use the Liang-Barsky line clipping algorithm to clip the line $P1(-15, -30) — P2(30, 60)$ against window having diagonally opposite corners $(5, 0)$ and $(15, 15)$. 6
5. (a) Write the steps for clipping the polygon given in the figure below using Sutherland-Hodgman polygon clipping algorithm. 8



- (b) How a spherical surface is represented in computer graphics? 4
- (c) Write the equation for a 3-D ellipse. 2
- (d) Discuss *any two* primary colour models used in computer graphics. 6
6. (a) Derive the transformation matrices for 3-D rotation of an object about all the three different axes. 9
- (b) Perform the scaling of the line PQ in the x -direction by 3 keeping point P fixed, then rotate this line by 45° anticlockwise about the z -axis. Given $P(1, 2, 3)$ and $Q(4, 6, 3)$. 5
- (c) Write the transformation matrices for the different types of 3-D reflection. 6
7. (a) Define parallel projection and perspective projection. $2+2=4$
- (b) Write a brief note on depth buffer method for elimination of hidden surface in a 3-D scene. 8

- (c) Show the flow of Painter's algorithm to plot the following triangles : 8

