Name : .....

Roll No. : .....

Invigilator's Signature : .....

2013

COMPUTER GRAPHICS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

   i) Bresenham's Algorithm seeks to select the optimum raster locations that represent a

      a) straight line b) curve line

      c) polygon d) none of these.

   ii) Clipping algorithms are

      a) two or three dimensional

      b) two dimensional

      c) three dimensional

      d) none of these.

iii) According to Simple Area Anti-aliasing. pixel is considered as

a) a mathematical point

b) a finite area

c) an infinite area

d) none of these.

iv) The slope of the Bezier curve at the starting of the curve is controlled by

a) first control point

b) first two control points

c) first three control points

d) all four control points.

v) If (x, y, w), $w \neq 0$, is a point in the homogeneous coordinate system then its equivalent in the two dimensional system is

a) $(x, y, 1)$ b) $(x, y, 0)$

c) $(x / w, y / w)$ d) $(x, y, x - y)$.

vi) An object is viewed by using perspective transformation. The maximum number of principal vanishing point(s) possible in pointer addressable memory is

a) 1 b) 2

c) 3 d) none of these.

vii) Two curves are said to be connected at a point with first order continuity if

a) both curves simply meet at that point

b) the tangents to both the curves at that point are equal

c) the curvatures to both the curves at that point are equal

d) there is a discontinuity of both the curves at that point.

viii) In Bresenham's circle generation algorithm, if (x, y) is the current pixel position then the y value of the next pixel position is

a) y or $y + 1$ b) y alone

c) $y + 1$ or $y - 1$ d) y or $y - 1$.

ix) In the Cohen-Sutherland line clipping algorithm, if the codes of the two points *P* & *Q* are 0101 & 0001 then the line segment joining the points *P* & *Q* will be the clipping window

a) totally outside

b) partially outside

c) totally inside

d) none of these.

x) Bresenham's line drawing is superior than DDA because

a) it does not require floating point arithmetic

b) no round-up is required

c) both (a) & (b)

d) it is easily computable.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Explain RGB colour model and show how it is related to CMY model.

3. Find normalized transformation matrix for window to viewport transformation, which uses the rectangle whose left corner is at (2, 2) and upper right corner is at (6, 10) as a window and the viewport that has lower left corner at (0.0) and upper right corner at (1, 1).

4. Prove that two scaling transformations are commutative, *i.e.* $S_1 S_2 = S_2 S_1$. Also the 2D rotation by α_1 followed by α_2 is same as a rotation of $\alpha_1 + \alpha_2$. $2\frac{1}{2} + 2\frac{1}{2}$

5. Explain Z-buffer algorithm.

6. Derive mid-point circle drawing algorithm.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Explain DDA Line Drawing algorithm.

   b) Digitize a line from (10, 12) to (20, 18) using Bresenham's Line Drawing Algorithm.

   c) What is anti-aliasing ?

   d) Explain any one technique of anti-aliasing. 6 + 4 + 2 + 3

8. a) What are Flood fill and Boundary fill algorithm ?

   b) Write down pseudo code of any one of them.

   c) How are they different ?

   d) Distinguish Bezier curve and B-Spline curve.

   3 + 6 + 2 + 4

9. a) Explain Sutherland-Hodgeman algorithm for polygon clipping.

   b) Magnify the triangle with vertices A (0, 0), B (1, 1), C (5, 3) to twice its size keeping C (5, 3) fixed.

   c) Find the transformation coordinates of a triangle ABC which is first reflected about x-axis and then about a line $y = -x$.

   6 + 4 + 5

10. a) What is homogeneous coordinate ?

    b) What is interlacing ?

    c) Develop general form of 3D rotation about x-axis and about y-axis.

    d) Discuss the working principle of coloured CRT display device.

    2 + 2 + 5 + 6

11. a) What do you mean by hidden surface removal ?

b) What is coherence ? Write down different types of coherences.

c) Explain briefly the methodology involved in Gourad Shading.

d) Indicate how it is different from Phong's shading.

2 + 5 + 5 + 3