FIRST TERM EXAMINATION, 2014

Q1.(a) What is meant by Scan conversion of a line? Mention three disadvantages of it.

Ans. Scan conversion or a scan rate conversion is a video processing technique for changing the vertical/horizontal scan frequency of video signal for different purposes and applications.

Problems: Approximation of lines by a finite number of pixels.

- Costly rounding of operations.
- Unnecessary floating point arithmetic
- Error accumulation

Q1.(b) Show that two successive 3d Translations are additive i.e TxTy=TyTx or TyTz=TzTy or TxTz=TzTx

Ans.

ROTATIONS

Two successive rotations applied to point P produce the transformed position

$$P' = R(\alpha 2).R(\alpha 1).P$$

$$= R(\alpha 2).R(\alpha 1).P$$

By multiplication the two rotation matrices, we can verify that two successive rotations are additive:

$$R(\alpha 2).R(\alpha 1) = R(\alpha 2+\alpha 1)$$

So that the final rotated coordinates can be calculated with the composite rotations matrix as

$$P' = R(\alpha 1+\alpha 2).P$$

Q1.(c) define the terms pixel, bitmap and resolution.

Ans

PIXEL: The pixel (a word invented from "picture element") is the basic unit of programmable color on a computer display or in a computer image.

BITMAP : A representation in which each item corresponds to one or more bits of information, especially the information used to control the display of a computer screen.

RESOLUTION : Resolution is the number of pixel(individual points of color) contained on a display monitor , expressed in terms of the number of pixels on the horizontal axis and the number on the vertical axis. The sharpness of the image display depends on the resolution and the size of the monitor.

Q1.d) What are the differences between the raster scan and random scam display devices?

Property	**Raster Scanning System**	**Random Scanning system**
Resolution	It has poor or less Resolution because picture definition is stored as a intensity value.	IT has High resolution because it stores picture definition as a set of line commands.
Electron-Beam	Electron Beam is directed from top to bottom and one row at a time on screen, but electron beam is directed to whole screen.	Electron Beam is directed to only that part of screen when picture is required to be drawn, oneline at a time so also called Vector Display
Cost	It is less expensive than Random Scan System	It is costlier than rastom scan.
Refresh Rate	Refresh rate is 60to 80 fps	Refresh Rate depends on the line to be displayed i.e 30to60 times per second
Picture Definition	It stores picture definition in Refresh Buffer also called Frame buffer	It sores picture definition as a set of line commands called Refresh Display Rate

Q2(a) Deduce the matric to shear an object by unit 5 along X-axis and then by unit 4-along Y axis.

Ans Shear along x axis = [1 shear(x)]
[0 1]

Shear along y axis = [1 0]
[shear(y) 1]

15 x 10 = 120010404

Q2(b) Use Cohen-Sutherland algorithm to clip the line P1_1,2) to P(8,5) with respect to the clipping window given by 0<=x<=7, 0<=y<=4.

Ans 1. Cohen Sutherland Line Clipping algorithm- The more efficient Cohen-Sutherland algorithm performs initial test on a line to determine whether the intersection calculations can be avoided.

Steps for Cohen-Sutherland Algortihm

1. End point pairs are checked for trivial acceptance or trivial rejected using the outcode.
2. If not trivial acceptance or trivial rejected, divided into two segments at a clip edge.
3. Iteratively clipped by testing trivial-acceptance or trivial-rejected, and divided into two segments until completely inside or trivial-rejected.

Trivial acceptance/reject test

To perform trivial accept and reject test, we extend the edges of the clip rectangle and divide the plane of clip rectangle into nine regions, Each region is assigned a 4-bit code determined by where the region lies with respect to the outside haldplanes of the clop rectangle edges. Each bit in the outcode is set to either 1 or 0, the 4 bit in code correspond to the following condition

Bit 1 outside half plane of the top edge y >Ymax

Bit 2 outside half plane of bottom edge Y <Ymin

Bit 3 outside half plane of right edge , X >Xmax

Bit 4 outside half plane of left edge, X<Xmin

Window Size (x1,y1) = (0,0)

And (x2,y2) = (7,4)

Given point P1 and P2 as (1,2) and (8,5)

Our codes

Outcode for P1= 0000 for P2 = 1010

Among P1 and P2 we get 000

So, the line is partially visible

Calculate Slope, m = 3/1

Calculate intersect points

Y = 7.33

Q3.(a) Derive the transformation matric that reflects an Object wrt a line Y = X.

Ans

Transformation matrix	Point Matrix	Multiplication	New Point Matrix
[0 1] [10]	[4] [3]	[4X0 + 3X1] [4X1 + 3X0]	[3] [4]

Q3b) Scan convert a line using Breshnam's line Drawing Algorithm from (1,1) to (8,5)

Ans delX = 8 – 1 = 7

delY = 5 – 1 = 4

2delY=8

2delX = 14

P0 = 8 -7 =1

Pk> 0 so next point is (2,2)

P1 = 1 + 2(4) – 2(7) = -5

So next point is (3,2)

Similarly, P2 = 4 next point is (4,3)

P3 = -2 ……..(5,3)

P4= 6……..(6,4)

P5=0…….(7,5)

P6=-6……..(8,5)

Hence points are (1,1),(2,2),(3,2),(4,3),(5,3),(6,4),(7,5),(8,5)

Q4) Plot a circle using Mid Point Circle Drawing Algorithm with centre (2,4) and radius 7 ?

Ans. r=7

(x,y) = (0,7) (taking (0,0) as centre)

Initail Decision Parameter = 1 – r = 1 – 7

P1 = -6 * 20

Plot(1,7)

P1=P + 2x + 1
P1= -6 + 2*1 + 1= -3

As (P1 < 0)

Plot (2,7)

P2 = -3 + 2*2 + 1 = 2

As (P1>0) Plot (3,6)

P1= 2 + 2(3) – 2y + 1
P3 = 2 + 6 – 12 +1 = -3

So Plot (4,6)

P4 = -3 + 2(4) + 1 = 6
So Plot (5,5)

Now (x=y), Now Stop

Add (2,4) to each calculated point

(0,7), (1,7) ,(2,7) ,(3,0) , (4,6) , (5,5)

(2,11) ,(3,11) ,(4,11) ,(5,10) ,(6,10) ,(7,9)