VIMAL JYOTHI ENGINEERING COLLEGE
CHEMPERI, KANNUR

ANSWER BOOKLET

Internal Test / Assignment No. .....1.....

Name of Student ...Anamika Prakash A.....PRN No. VML19CS027

Roll No.....14..... Batch/ Class : CSE A

Course (Subject) Computer Graphics Code CST 304 Slot.....

Max Marks.....60.....Date of Examination : 11-05-22 FN/AN

Academic Year: 2021-22 Semester S6

Name of the Faculty hanlding the Subject : Ms Asha.

Signature of Student:

Sudharsana 11/5/22 Vijayan
Name & Signature of Invigilator

Question No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
a	3	0	3	3	1	2	0	6	2	4	4		3	
b													1	
c														
Total marks									32					

Date of Valuation: 15/05/22
For Instructions to candidate please refer back page

Asha Baby
Name & Signature of Examiner

Signature Not Verified
Principal.VJEC

1) • Educational and training purpose

Computer graphics generated pictures and models are used for educational purpose and virtual trainings are provided using computer graphics

• In biology

In Molecular biology molecules are displayed in the screen with help of computer graphics

• Computer graphics map

Town planners and transportation engineers use the computer generated map to help in their work

• Graphics presentation

Display of Pie chart, square chart etc use computer graphics

• Flight simulator

Pilots are given virtual training using computer graphics instead of flying aeroplanes

• Entertainment

Computer graphics is used to create moving image and videos in television etc

2) 1024 * 2048 - Resolution

for 8 bits per pixel $\frac{1024 * 2048}{8}$

$128 * 256$

for 12 bits

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3)

Raster scan display	Random scan display
1) Less resolution	1) High resolution
2) Electron beam is sweapt across the screen one row at a time left to righ from top to bottom	2) Electron beam is given to points of the screen only where picture is to be drawn
3) Refresh rate is 60-80 / sec	3) Refresh rate is 30-60 / sec
4) Picture definition is stored in refresh buffer	4) Picture definition is store as set of line drawing commands in refresh display file
5) Real images are formed	5) Doesn't form real image
6) Less expensive	6) Expensive

4) $(10, 20)$ to $(20, 30)$

$x_1\ y_1$ $\quad$ $x_2\ y_2$

$$m = \frac{dy}{dx} = \frac{30-20}{20-10} = \frac{10}{10} = 1.$$

$$abs(dy) = abs(dx)$$

$\therefore$ step $= 10$.

$(x = x_1 = 10$ & $y - y_1 = 20)$

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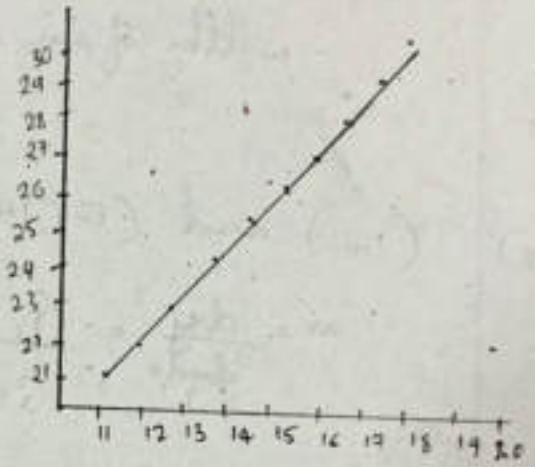
$x_{inc} = \frac{dx}{10} = \frac{10}{10} = 1$

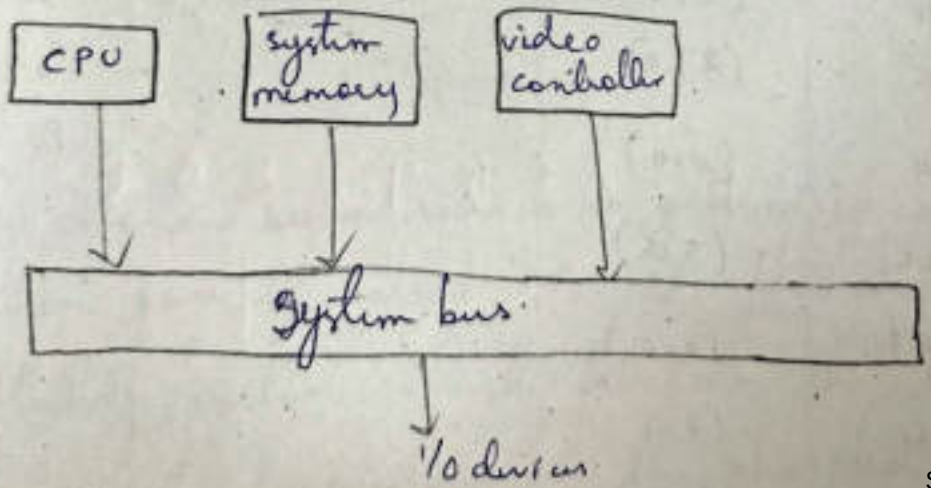
$y_{inc} = \frac{dy}{10} = \frac{10}{10} = 1$

k.	x, y.
0	(11, 21)
1	(12, 22)
2	(13, 23)
3	(14, 24)
4	(15, 25)
5	(16, 26)
6	(17, 27)
7	(18, 28)
8	(19, 29)
9	(20, 30)

(10,20)



5) Raster scan display system



6) Persistance -

- **Resolution** - Resolution is the total number of pixel that is displayed on a given screen of computer or television.
- **Aspect ratio** - Aspect ratio is the ratio between width of an image to height of an image.

7) (1,1) and (12, 14)

$$m = \frac{dy}{dx} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{14-1}{12-1} = \frac{13}{11} = 1.1$$

$P_k = P_0 + 2dy$

$1 = P_0 + 2dy - 2dx$

$P_0 = 2dy - dx$

$2dy - 2dx$
$= 26 - 22 = 4$.

$= 26 - 11 = 11$.

k	P_k	x_{k+1}, y_{k+1}
0	11	(2, 2)
1	15	(3, 3)
2	19	(4, 4)
3	23	(5, 5)
4	27	(6, 6)
5	31	(7, 7
6	35	(8, 8)
7	39	9, 9
8	43	10, 10

$P_1 = 11 + 4 = 15$

$P_2 = 15 + 4 = 19$

$P_3 = 19 + 4 = 23$

$P_4 = 23 + 4 = 27$

$P_5 = 27 + 4 =$

$31 + 4 =$

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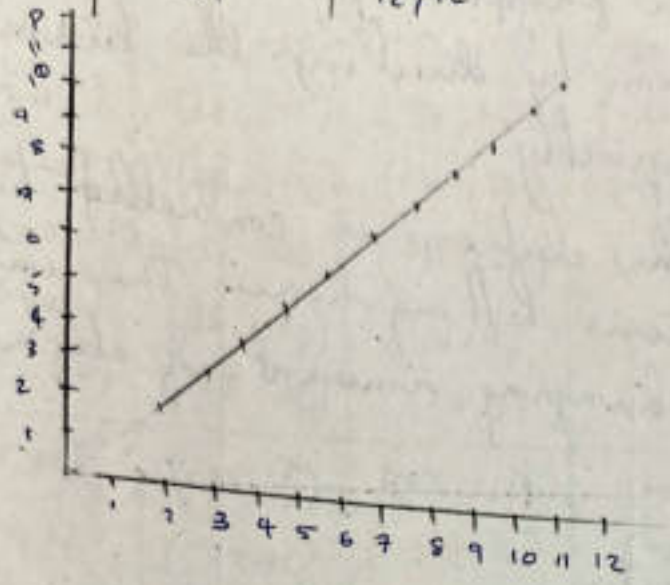
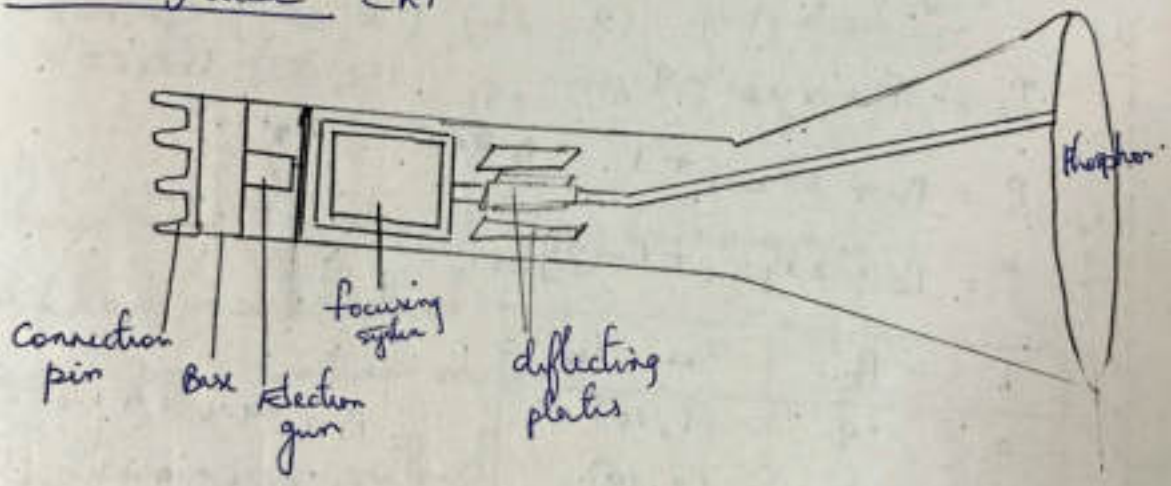
9	47	11, 11
10	51	12, 12



11) Cathod ray tube CRT



- The electron beam which is generated in the electron gun is passed to the focusing and deflecting system which directs the beam to the specified position in the phosphor screen.
- When the electron beam hits the phosphor screen in specific pairs then the phosphor emits small

amount of light when electron beam was hit.

- The emission of the phosphor fades fast hence the picture is redrawn by directing the beam to specific positions quickly
- The intensity of the electrons is controlled by the number of electrons hitting hence the intensity is changed by changing amount of electrons.

8) (30, 15) → centre

radius 10.

$x, y = (0, 10)$

$P_0 = 1 - r = -9.$

$P_1 = P_0 + 2x_{k+1} + 1$ $P_0 \not< 0$. x_{k+1}, y.

$x+1, y-1$

$P = P_0 + 2x_{k+1} + 1 - 2y_{k+1}$

k	P_k	x_{k+1} y_{k+1}
0	-9	(1, 10)
1	-6	(2, 10)
2	-1	(3, 10)
3	6	(4, 9)
4	-3	(5, 9)
5	8	(6, 8)
6)	7	(7, 7)

$P_1 = -9 + 2 + 1 = -6$

$P_2 = -6 + 4 + 1 = -1$

$P_3 = -1 + 6 + 1 = 6$

$P_4 = 6 + 8 + 1 - 16 = -3$

$P_5 = -3 + 10 + 1 = 8$

$P_6 = 8 + 12 + 1 - 14 = 7$

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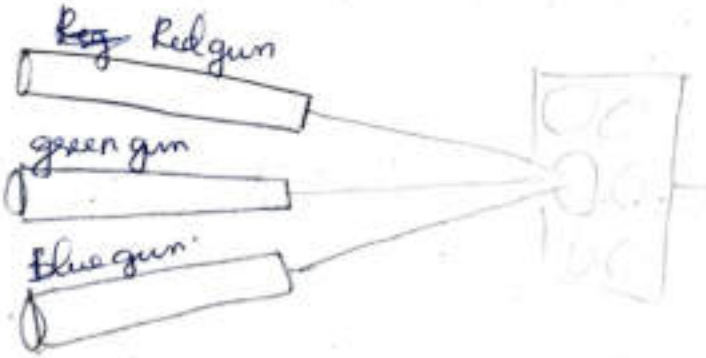
(x, y)	(x, -y)	(-x, y)	(-x, -y)
(31, 25)	(31, -25)	(-31, 25)	(-31, -25)
(32, 25)	(32, -25)	(-32, 25)	(-32, -25)
(33, 25)	(33, -25)	(-33, 25)	(-33, -25)
(34, 24)	(34, -24)	(-34, 24)	(-34, -24)
(35, 24)	(35 -24)	(-35, 24)	(-35, -24)
(36, 23)	(36 -23)	(-36, 23)	(-36, -23)
(37, 22)	(37 -22)	(-37, 22)	(-37, -22)
(25, 31)	(-25, 31)	(25, -31)	(-25, -31)
(25, 32)	(-25, 32)	(25, -32)	(-25, -32)
(25, 33)	(-25, 33)	(25, -33)	(25, -33)
(24, 34)	(-24, 30)	(24 -34)	(-24, -34)
(24, 35)	(-24, 35)	(24 -35)	(-24, -35)
(23, 36)	(-23, 36)	(23, -36)	(-23, -36)
(22, 37)	(-22 37)	(22, -37)	(-22, -37)

10) There are 2 color display techniques
- Shadow mask method
- Beam penetration method

Shadow mask method



Three types of gun are used in this method
- The beam from three guns are collided in

dot triangle for images

- If only red electron gun is on then red color is got
- Other different colours are formed by the combination of these 3 colours

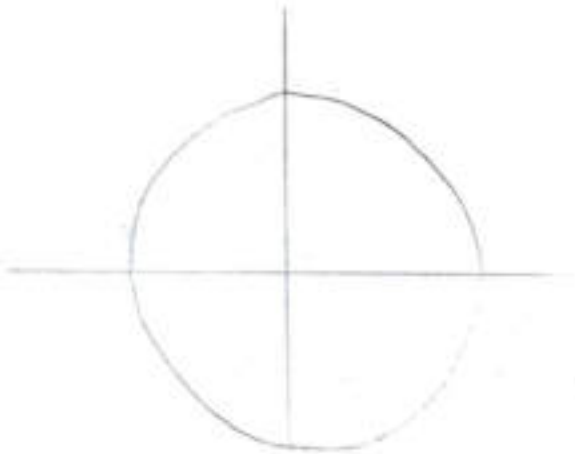
Beam penetration method

- Two layers of phosphor is seen in this method red outer layer green inner layer
- High intensity beam is needed to penetrate the red layer and go inside the layer

13) a) (x, y)

8 points →

(x, y)
(x, -y)
(-x, y)
(-x, -y)
(y, x)
(y, -x)
(-y, x)
(-y, -x)



13) b) Random scan display

14) $r = 8$

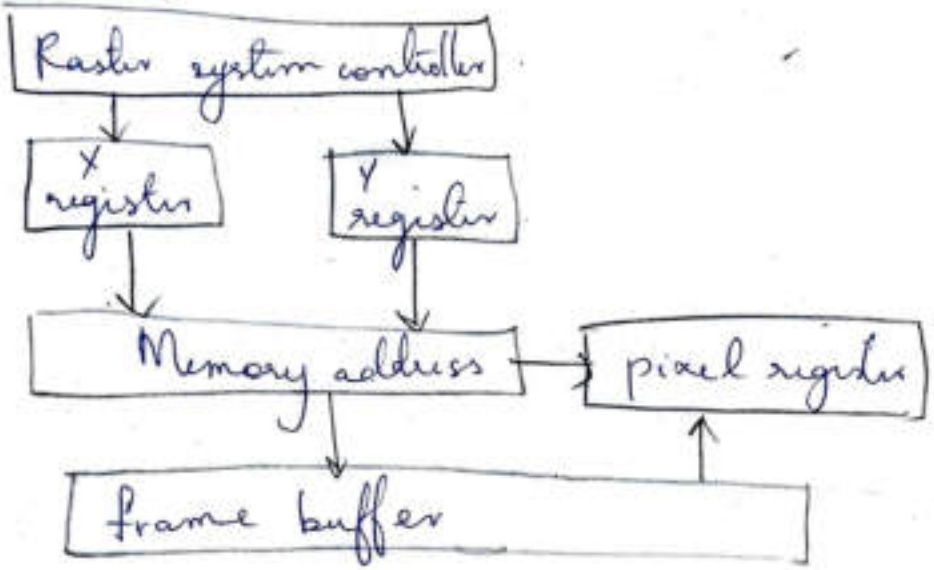
point - $(0, 8)$.

$P_0 = 3 - 2r = 3 - 16 = -13$.

$P_1 = P_0 + 4x_k + 6$

$P_0 + 4(x_k - y_k) + 10$.

9) Video controller.



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VIMAL JYOTHI ENGINEERING COLLEGE
CHEMPERI, KANNUR

ANSWER BOOKLET

Internal Test / Assignment No. .....1.....

Name of Student .....Aditya Tejus..... PRN No.....VHL19CS009...

Roll No.....05..... Batch/ Class :.....S6 - CSE A.....

Course (Subject) Computer Graphics & Image Pr... Code.....CST 304.....Slot.....A.....

Max Marks.....60..... Date of Examination : .....11 May 2022..... FN/AN

Academic Year: .....2022..... Semester .....S6.....

Name of the Faculty hanlding the Subject : .....Ms. Asha Baby.....

Signature of Student:

Name & Signature of Invigilator

Question No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
a	3	3	2	3	0	3			1	1	1	3		
b												1	2	
c														
Total marks									23					

Date of Valuation: 15/05/22

For Instructions to candidate please refer back page

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Name & Signature of Examiner

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1) i) Morphing

(ii) Engineering graphics

(iii) Medical field

(iv) Archeological department

(v) Education sector.

(vi)

Computer graphics is widely used in morphing, ie. in several applications where peoples faces are changed and they give a estimated figure about how we would look after we grow old.

In engineering graphics for drawing lines and graphs inside the computer becomes lot easier rather than going for drawing in pen and paper.

Medical field it is used for architectual setup and other. helps inside the computer.

Archeological department also uses of computer graphics for drawing a rough idea of images of old monuments

Education sector it is also used for various presentation purposes like ~~power~~ ppts, xls etc.

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2) Given resolution

$= 1024 * 2048$.

∴ To store 8 bits per pixel the total resolution would be

$= 1024 * 2048 * 8$ bits

$= 2097152$ bits

If we convert to bytes

$$\frac{1024 * 2048 * 8}{8} = 2097152 \text{ bytes}$$

If the storage required is 12 bits per pixel then

$= 1024 * 2048 * 12$

$= 2097152 * 12$ bits

If we convert to byte

$$= \frac{1024 * 2048 * 12}{8}$$

$$= \frac{2097152 * 1.5}{2}$$

$= 1048576$ bytes

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3)

Raster scan display	Random scan display
• Gives less resolution	• Provides high resolution
• Whole rows are traversed. ie all frames are checked	• Only the part which we need are traversed
• Less expensive	More expensive than rastes
• A zig zag pattern is formed	• A straight line is formed
• Consumes lot of time	Consumes less time than raster.

4) (10,20) to (20,30)

(x_1, y_1) (x_2, y_2)

$dx = x_2 - x_1 = 20 - 10 = 10$

$dy = y_2 - y_1 = 30 - 20 = 10$

$m = \frac{dy}{dx} = \frac{10}{10} = 1$

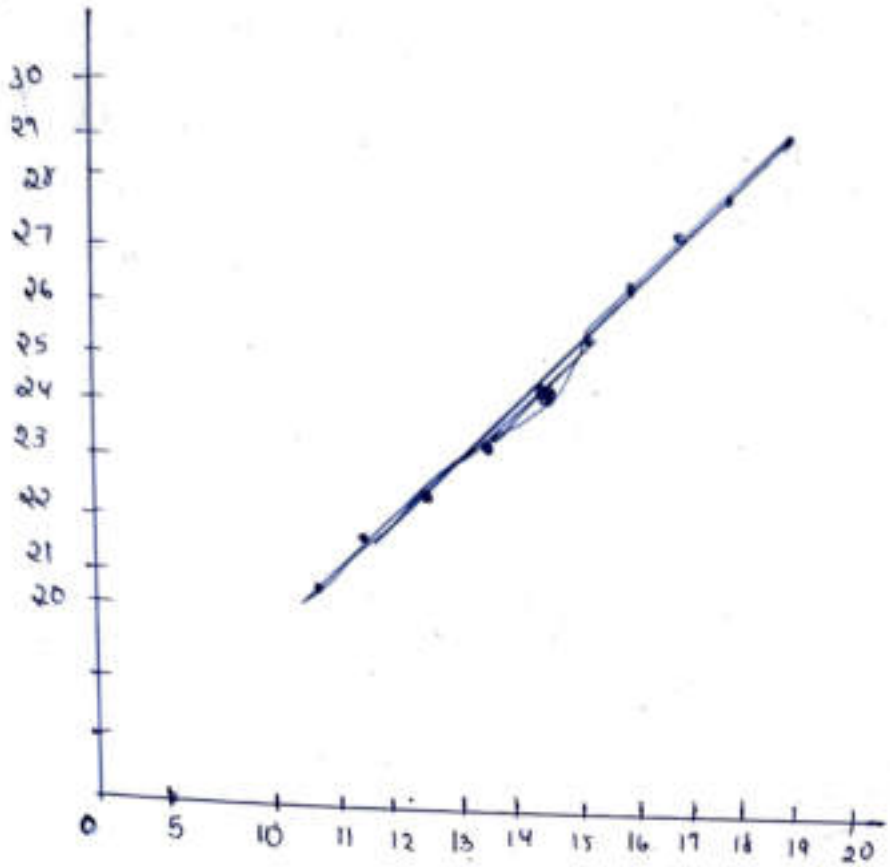
$|abs\ dx| = |abs\ dy|$

step = 10

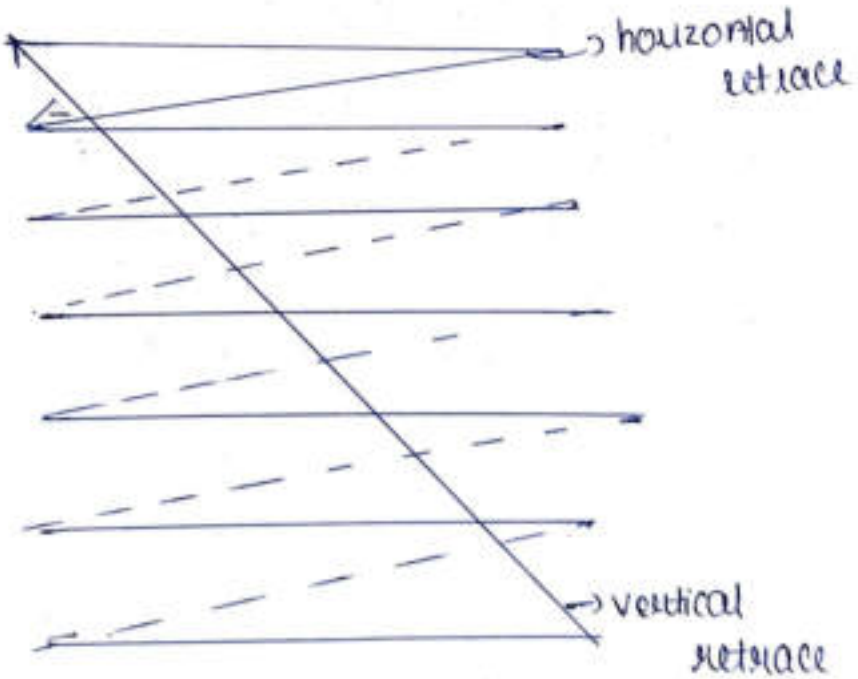
$x_{inc} = \frac{dx}{step} = 1$ $\quad y_{inc} = \frac{dy}{step} = 1$

K = 0 to 9

K	(x_1, y_1)
0	(11, 21)
1	(12, 22)
2	(13, 23)
3	(14, 24)
4	(15, 25)
5	(16, 26)
6	(17, 27)
7	(18, 28)
8	(19, 29)
9	(20, 30)



5) Raster Scan Display system



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In raster scan display, the pixel elements are scanned from topmost left corner. The pixel are scanned in a row and then horizontal retraced to the second row and then it goes on i the pixel elements until the last row is reached.

Sometimes to provide refresh rate a vertical retrace is done. and it again moves back to original position

Raster san display is a slow process as it checks each and every row ~~and~~ Compared to other methods

It also provides less resolution, it is less expensive.

6) Persistence

It is the amount of time taken for the pixel to reduce its intensity to $1/10^{th}$ of its original intensi

Resolution

It is the total no of pixels without overlap.

Aspect ratio

It is the ratio of width to height of a pixe

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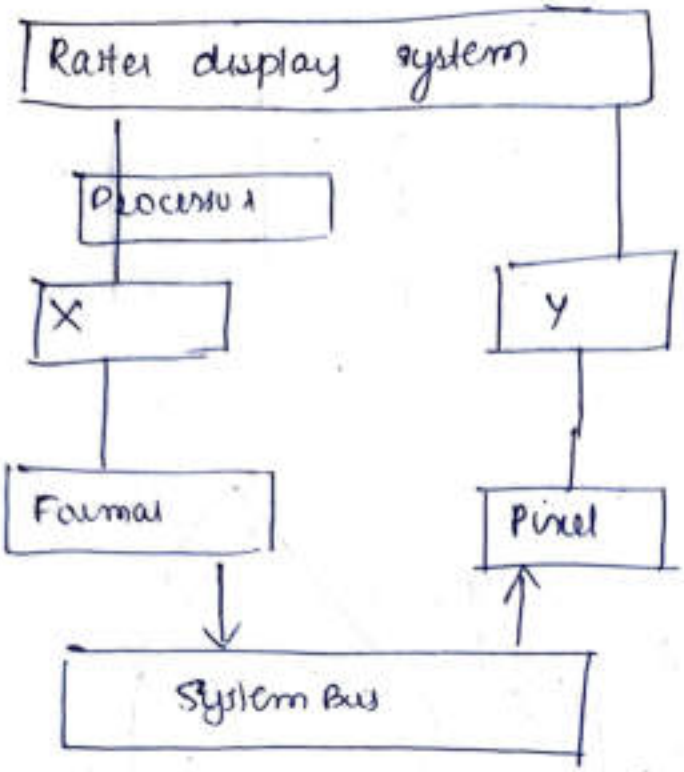
9)



10) The two basic techniques used for producing colour displays with CRT are

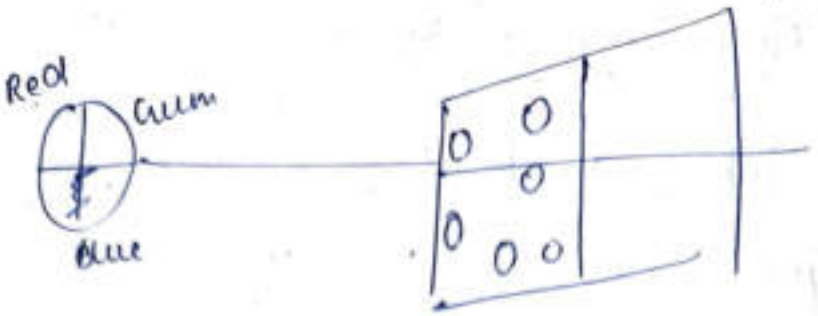
i) Beam Penetration method

In this method two colours red and green is used for beam penetration method.

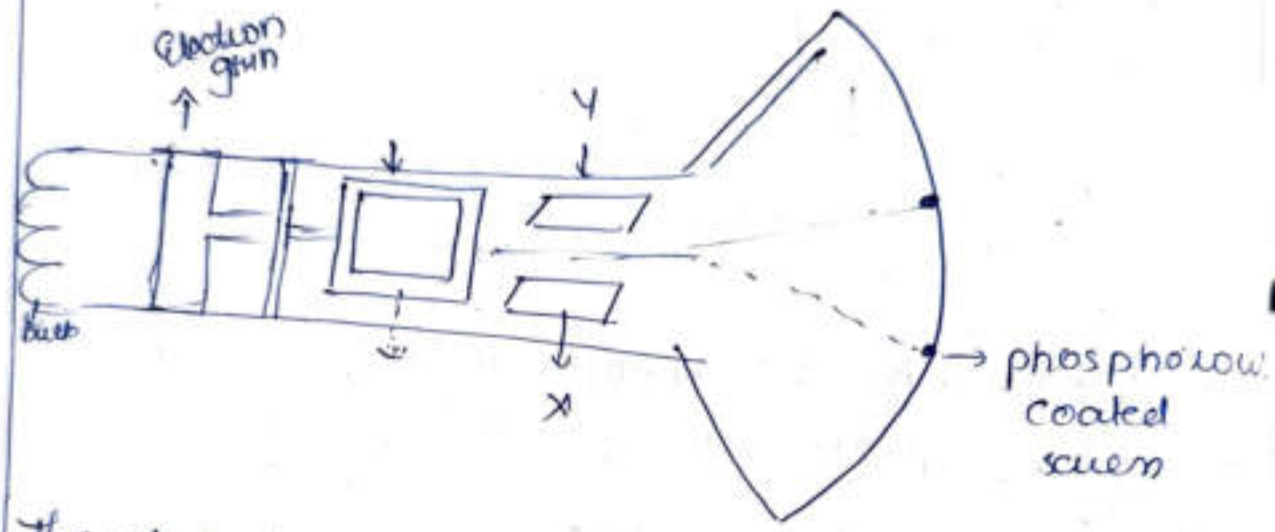
- If it strikes with a slow pace then it only effect red colour
- If it strikes with a high pace then it penetrates and also effects the green colour.

(ii)

In this method three colours are used red, green and blue



11)



The elections are transmitted through the electron gun and then it is deflected to the screen.

~~Pho~~ The screen is coated with phaphous.

12) DDA Algorithm

Advantages

1) It became easier rather than to use $y = mx + c$ to solve equation

2) It does not involve multiplication

3) It only involves addition of 2 entities

Disadvantages

1) Since floating point numbers are rounded to their nearest integer the results may turn out to be inappropriate

2) Both the floating point and rounding off calculations are complex

b) DVST

(Direct View Storage Tube)

It contains two guns

First gun is used for creation of next image

The second gun is used for maintenance

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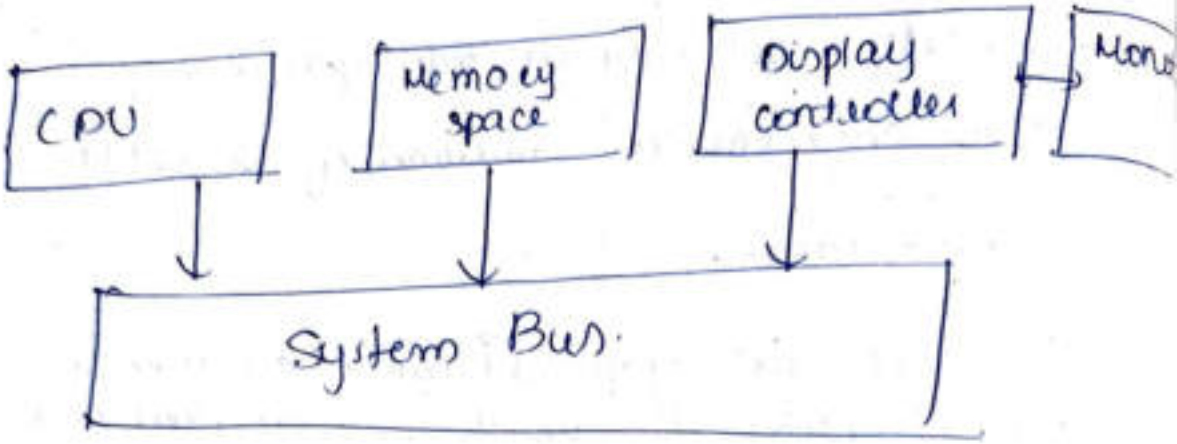
B

b) Architecture



Calculation

1024 x 20

2048 x 1024

8192

4096

0000.

2048

2097152

1048576

2 | 2097152

2

009

0.5

17

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VIMAL JYOTHI ENGINEERING COLLEGE
CHEMPERI, KANNUR

ANSWER BOOKLET

Internal Test / Assignment No. ....2....

Name of Student ....E.P. GOPIKA.... PRN No. VML19CS056

Roll No. 28 Batch/ Class : CS A

Course (Subject) COMPUTER GRAPHICS & IMAGE PROCESSING Code Slot

Max Marks. 60 Date of Examination : 08.06.2022 FN/AN ✓

Academic Year: 2022 Semester S6

Name of the Faculty hanlding the Subject : Ms. ASHA

Signature of Student: Name & Signature of Invigilator

Question No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
a	0	0	3	3	3	3	3	3	3	7	5		3	5
b							4	1	9		2			
c														
Total marks													53 ½ 47	

Date of Valuation: 10/06/2022

For Instructions to candidate please refer back page

Name & Signature of Examiner

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PART- A

1. Reflection about x axis: Reflection about y axis:

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

rotation matrix - $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$\theta = 90$

$\begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

2. Successive reflections:

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

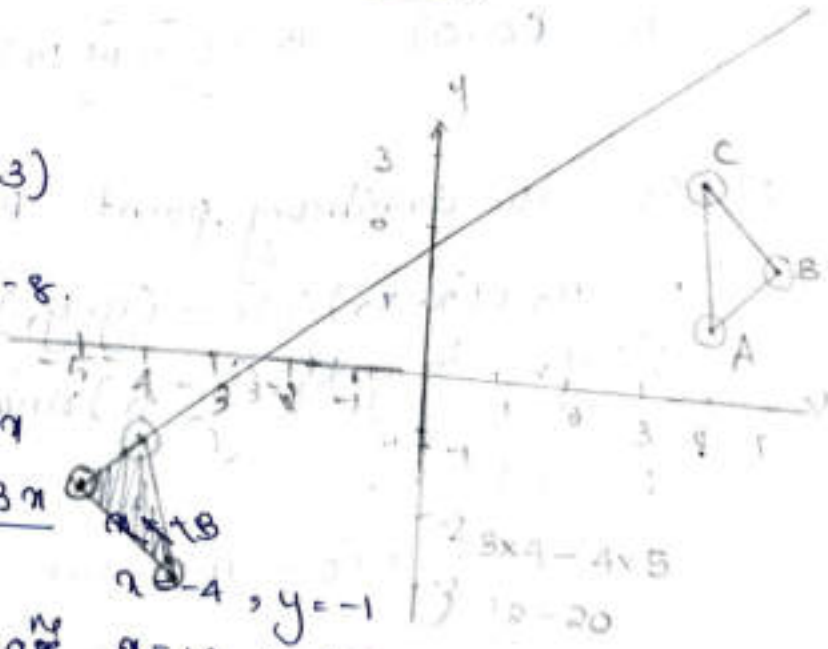
2. $3x + 4y + 8 = 0$

A(4,1) B(5,2) C(4,3)

$3x - 4y + 8 = 0$ $\quad 3x - 4y = -8$.

$3x = -8 + 4y \quad -4y = -8 - 3x$

$x = \frac{-8+4y}{3} \quad -y = \frac{-8-3x}{4}$



$x = -4, y = -1$

$x = 12, y = 20$

Reflection about xy plane

$\Rightarrow x' = -x \quad y' = -y$.

$\therefore$ A' (-4, -1)

B' (-5, -2)

C' (-4, -3).

8. $\theta = 45°$ about the origin

1) About the origin A (0,0)
   B (10,10)
   C (50,20)

$x' = x\cos\theta + y\sin\theta$

$y' = x\sin\theta + y\cos\theta$

A.

$x' = 0(\cos 45) - 0(\sin 45)$

$= 0$

$y' = 0(\sin 45) + 0(\cos 45) = 0 = (0,0)$

B.

$x' = 10\cos 45 - 10\sin 45 = 0$

$y' = 10\sin 45 + 10\cos 45 = 10\sqrt{2}$ $(0, 14.14)$

C:

$x' = 50\cos 45 - 20\sin 45 = 15\sqrt{2}$

$y' = 50\sin 45 + 20\cos 45 = 35\sqrt{2}$ $(21.21, 49.49)$

$\therefore A' = (0,0)$ $B' = (0, 14.14)$ $C' = (21.21, 49.49)$

2) About an arbitrary point P(-10,-10)

$x' = x_r + (x - x_r)\cos\theta - (y - y_r)\sin\theta$

$y' = y_r + (x - x_r)\sin\theta + (y - y_r)\cos\theta$

A (0,0)

$x' : -10 + (0 - -10)\cos 45 - (0 - -10)\sin 45 = -10$

$y' : -10 + (0 - -10)\sin 45 + (0 - -10)\cos 45 = -10$

B (10,10)

$x' = -10 + (10 - -10)\cos 45 - (10 - -10)\sin 45$

$= -10$

$y' = -10 + (10 - 10)\sin 45 + (10 - 10)\cos 45 = 18.08$

C (50, 20)

$x' = -10 + (50 - 10)\cos 45 - (20 - 10)\sin 45 = 11.21$

$y' = -10 + (50 - 10)\sin 45 + (20 - 10)\cos 45 = 53.63$

$A' = (-10, 10)$ $B' = (-10, 18.08)$ $C' = (11.21, 53.63)$

4. rotation matrix:

$$\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

2 Successive rotations:

a.b - b.a

$$AxB \Rightarrow \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} \cos\theta\cdot\cos\theta + -\sin\theta\cdot\sin\theta + 0 & \cos\theta\sin\theta + \sin\theta\cos\theta + 0 & 0+0+0 \\ \sin\theta\cos\theta + \cos\theta\sin\theta + 0 & -\sin\theta\sin\theta + \cos\theta\cos\theta + 0 & 0+0+0 \\ 0+0+0 & 0+0+0 & 0+0+1 \end{bmatrix}$$

$$= \begin{bmatrix} \cos^2\theta + \sin^2\theta & 2\cos\theta\sin\theta & 0 \\ 2\sin\theta\cos\theta & -\sin^2\theta + \cos^2\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \text{--- (1)}$$

$$BxA \Rightarrow \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \Rightarrow \begin{bmatrix} \cos\theta - \sin\theta & 2\cos\theta\sin\theta & 0 \\ 2\sin\theta\cos\theta & -\sin\theta + \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} \cos^2\theta\sin^2\theta & 2\cos\theta\sin\theta & 0 \\ 2\sin\theta\cos\theta & -\sin^2\theta + \cos^2\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$\therefore$ commutative

5.

Object space method	Image space method
• Objects are compared with parts of objects to determine visibility	• Point by point or pixel by pixel are compared to determine visibility
• Implemented on physical coordinates	• Implemented in screen coordinates.
• Complexity = $O(n^2)$ where n = object	• Complexity = $O(np)$ where p = pixel
• Complexity increases with increase in the no. of objects	• Complexity increases when complexity of the parts increases.

6. $S_x = \frac{x_{vmax} - x_{vmin}}{x_{wmax} - x_{wmin}}$ $S_y = \frac{y_{vmax} - y_{vmin}}{y_{wmax} - y_{wmin}}$

$x' = x_{vmin} + (x - x_{wmin}) S_x$

$y' = y_{vmin} + (y - y_{wmin}) S_y$

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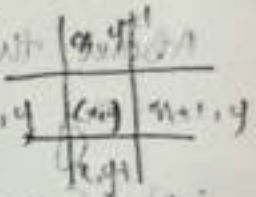
PART-B

Boundary
Flood
Scanline

Boundary filling algorithm:

1. Create a boundary region
2. Select a point (x,y)
3. Get the color of the pixel
   color
   ~~Get~~=getpixel (x,y)
4. If color is not equal to boundary color & fill colour, paint the pixel.
5. Repeat for its neighbours.



→Implemented using eight connected approach:

```
boundary-filling8 (int x, int y, int fill_color, int boundary_color)
{
    If (getpixel (x,y) != fill_color && getpixel(x,y) != boundary_color)
    {
        putpixel (x, y, fill_color)
        boundary-filling8 ( x , y+1 , fill_color, boundary_color);
        boundary-filling8 ( x , y-1 , fill_color, boundary_color);
        boundary-filling8 (x+1, y , fill_color, boundary_color);
        boundary-filling8 (x-1, y , fill_color, boundary_color);
        boundary-filling8 (x-1, y+1, fill_color, boundary_color);
        boundary-filling8 (x-1, y-1, fill_color, boundary_color);
        boundary-filling8 (x+1, y+1, fill_color, boundary_color)
        boundary-filling8 (x+1, y-1 , fill_color, boundary_color)
    }
}
```

$x-1, y+1$	$x, y+1$	$x+1, y+1$
$x-1, y$	x, y	$x+1, y$
$x-1, y-1$	$x, y-1$	$x+1, y-1$

b. A(10, 8) B(22, 8)
C(34, 17) D(10, 27)

About the origin
$= xy \quad x' = -x \quad y' = -y$

$\therefore A' = (-10, -8) \quad B' = (-22, -8)$
$C' = (-34, -17) \quad D' = (-10, -27)$

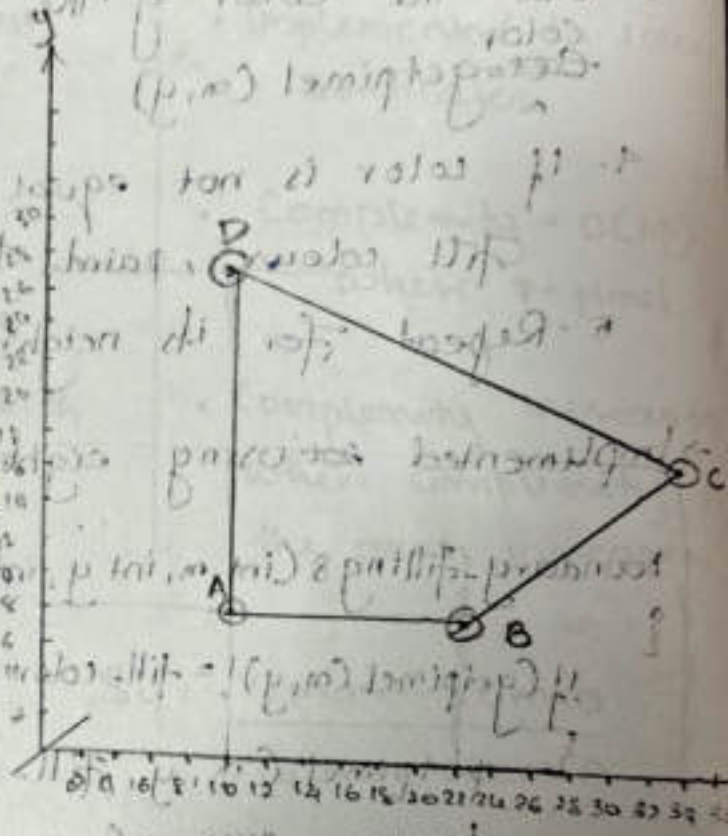
$S_x = 2 \quad S_y = 3$

$Ax' = -10 \times 3 = -20$
$Ay' = -8 \times 3 = -16$
$A'' = (-20, -16)$ //

$Bx' = -22 \times 3 = -44$
$By' = -8 \times 3 = -16$ $B'' = (-44, -16)$

$Cx' = -34 \times 3 = -68$
$Cy' = -17 \times 3 = -34$ $C'' = (-68, -34)$

$Dx' = -10 \times 3 = -20$
$Dy' = -27 \times 3 = -54$ $D' = (-20, -54)$



New positions are:

$A'' : (-20, -16) \; B''(-44, -16) \; C''(-68, -34) \; D''(-20, -54)$

8. a) → Homogeneous coordinates: (x_0, y_0, h).
→ Cartesian coordinates (x, y) are represented as (x_0, y_0, h).
→ They are used to represent basic transformation equations into matrix form.
→ For simplification we take $h = 1$.
→ For eg: translation:

$$x' = x + tx$$
$$y' = y + ty$$

matrix representation: $\begin{bmatrix} 1 & 0 & tx \\ 0 & 1 & ty \\ 0 & 0 & 1 \end{bmatrix}$

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & tx \\ 0 & 1 & ty \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

b.). A(0,0) B(1,0) C(1,1) D(0,1).
$y_{ref} = -2$ $sh_x = 1/2$

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & sh_x & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

$$x' = x + sh_x y_{ref}$$
$$y' = y$$

A: $x' = 0 + 1/2 \times 0 = 0$, $y' = -2$
B: $x' = 1 + 1/2 \cdot 0 = 1$, $y' = -2$
B: $x' = 1 + 1/2 \cdot 1 = \frac{2+1}{2} = 3/2$, $y' = -2$
C: $x' = 0 + 1/2 \cdot 1 = 1/2$, $y' = -2$

9. a. Cohen - Sutherland line clipping algorithm:

Step 1: Assign region codes to the end points of the line.

Step 2: If the region code for both the end points are 0000, the line is completely inside. Save it.

Step 3: ~~Else line is partli~~

If step 2 fails, perform logical AND operation on the region code.

3.1. If the result is not 0000, the line is completely outside.

3.2. Else line is partially inside.

3.3. a. Choose an end point of the line, outside of the rectangle boun

3.2 b. Find the intersection point

3.3 c. Replace the end point with with the intersection point & find the region code.

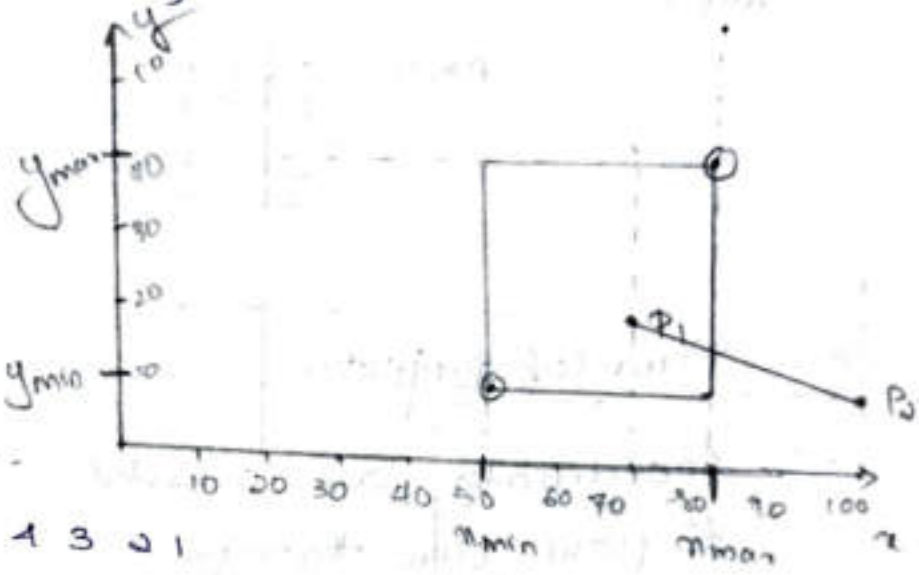
3.3.d If it is 0000, line. Repeat step till a line that is accepted or rejected is found.

Step 4: Repeat step 1 for all points.

$P_1(70,20)$
$P_2(100,10)$

Lower left hand corner = (50,10)
Upper right hand corner = (80,40)

$x_{min} = 50$ $y_{min} = 10$
$x_{max} = 80$ $y_{max} = 40$



region code for P_1.

1 = signbit $(x - x_{min})$
2 = signbit $(x_{max} - x)$
3 = signbit $(y - y_{min})$
4 = signbit $(y_{max} - y)$

1 3 2 1

1 = signbit $(70 - 50) = 20$
2 = signbit $(80 - 70) = 10 \Rightarrow (0000)$
3 = signbit $(20 - 10) = 10$
4. signbit $(40 - 10) = 20$

region code for P_2.

1 = signbit $(100 - 50) = 50$ 0
2 = signbit $(80 - 100) = -20$ 1
3 = signbit $(10 - 10) = 0$ $\Rightarrow (0010)$
4 = signbit $(40 - 10) = 30$

AND: 0000
0010
0000 line is partially inside.

$m = \frac{-10}{30} = -\frac{1}{3}$

$m = \frac{y - y_1}{x - x_1}$

$P_2(x, y_{min}) =$

$x = \frac{y - y_1}{m} + x_1 \Rightarrow \frac{10 - 10}{-1/3} + 100 = 100$

$P_2' = (100, 10)$.

region code.

Signbit(100-50) = 50
Signbit(80-100) = -20
Signbit(10-10) = 0
Signbit(90-10) = 30

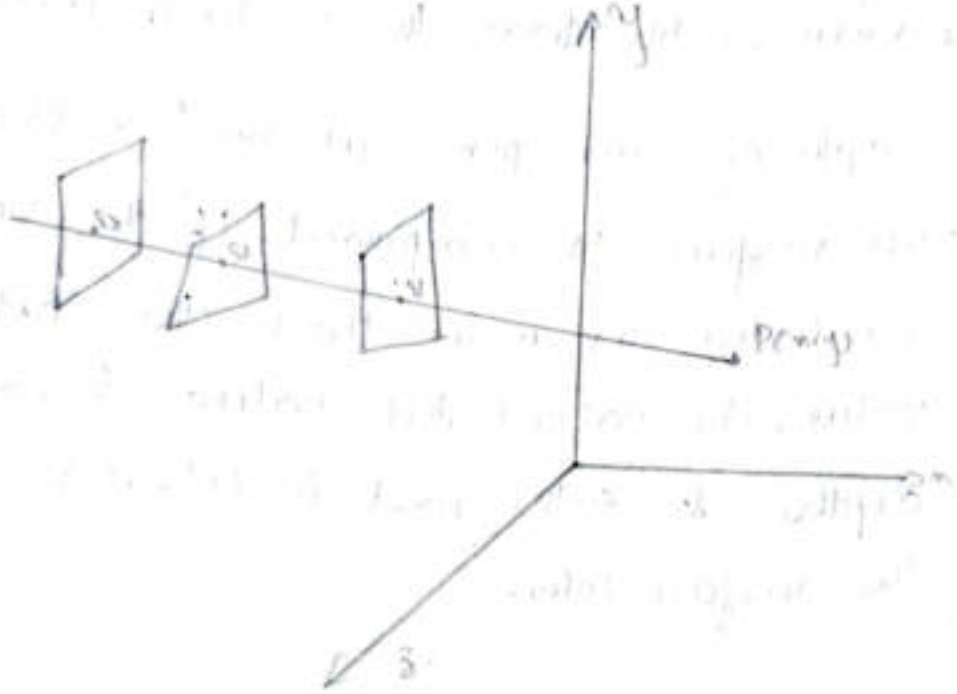
= 0100

AND: 0000
0100
0000

b.

Parallel projection	Perspective projection
→ Coordinates are converted to plane view through parallel lines	→ Object coordinates are converted to plane view through ~~the~~ converging lines called center projection.
→ ~~Is~~ less realistic representation of 3D object	→ More realistic representation of 3D object.
→ Distance from the center to object is infinite	→ Distance from the center to object is infinite
→ Projecter lines are ~~not~~ Parallel	→ Projecter lines are not parallel.
→ ~~less~~ less realistic view of the object	→ More realistic view of the object
→ No such effect.	→ Object becomes small as the distance increases and bigger when distance decreases

Depth Buffer Algorithm:



There are 2 buffers refresh buffer & depth buffer.

Algorithm:

1) Initialise depth buffer & refresh buffer.

refresh buffer = $I_{background}$ depth buffer = 0

2) Compare depth of each point at each surface Co-ord

If z > calculated depth,

depth_buffer = z refresh_buffer = $I_{surface}$

3) Finally the depth buffer will have the highest value of depth & all the pixels of the object will be colored.

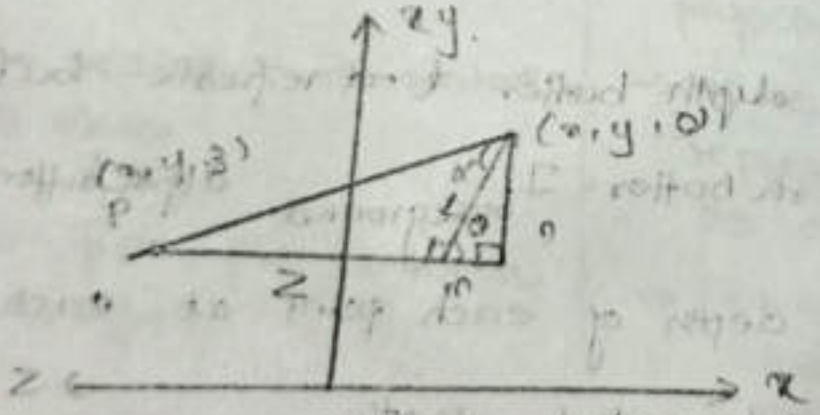
where, $I_{background}$ is the background color &

$I_{surface}$ is the surface color.

This algorithm is used to find the areas of the screen visible from the certain areas.

The depth of each pixel at similar positions in each surface is compared. If the value calculated is more that the initial value, the calculated value becomes the depth & the pixel is colored with the surface color.

11. a) Transformation equation for oblique parallel projection



$x' = x + m$ — ①

$y' = y + n$ — ②.

we know $\cos\theta = \frac{m}{L} \Rightarrow m = L\cos\theta$

$\sin\theta = \frac{n}{L} \Rightarrow n = L\sin\theta$

sub in ①, ②

$x' = x + L\cos\theta$ — ③

$y' = y + L\sin\theta$ — ④.

$\tan\alpha = \frac{L}{z} \Rightarrow L = z\tan\alpha$

$x' = x + \cot\alpha z \cos\theta$

$y' = y + \cot\alpha z \sin\theta$.

$\cot\alpha = \frac{z}{\tan\alpha}$

sub in ③, ④

b). Cavalier

- makes an angle of 45°
- The projection lines from the projected plane are of the same size
- less realistic.

Cabinet

- makes an angle of 63.4° w the projection
- Projection lines are of ½ the size
- More realistic

13. 3D transformation.

~~Tranforming~~

→ Changing the geometrical points of an object is called transformation.

→ Mapping of 2D points to a 3D plane view.

→ Common transformations are:
- Translation
- Rotation
- Scaling.

• Translation.

$x' = t_x + x$
$y' = t_y + y$
$z' = t_z + z$.

All points of the object is moved along a straight path.

⇒ Rotation.

$x' = x\cos\theta - y\sin\theta$

~~$y' = y\cos\theta$~~

$y' = x\sin\theta + y\cos\theta$ — w.r.t z.

$x' = y\cos\theta - z\sin\theta$

$y' = y\sin\theta + z\cos\theta$ — w.r.t x

$x' = z\cos\theta - x\sin\theta$

$y' = z\sin\theta + x\cos\theta$ — w.r.t y.

All points of the object is moved along a circular path.

⇒ Scaling.

$x' = s_x \cdot x$

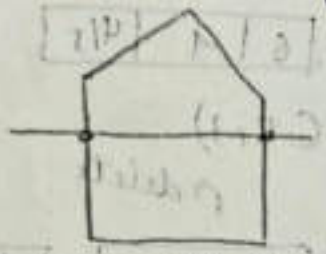
$y' = s_y \cdot y$

$z' = s_z \cdot z$

The size of the object is changed.

14. Scan line polygon filling algorithm:

1) All of the points where the scan line intersects edges of the polygon are noted
2) Intersections are arranged in increasing order of y i.e y_{min} to y_{max}
3) These are made to a pair & colored.



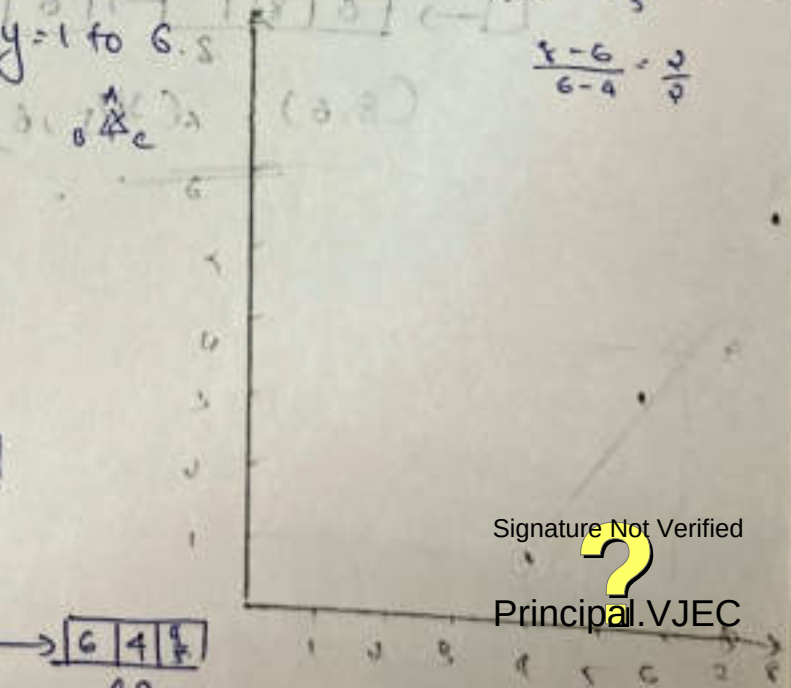
The points where the scanline intersects the edges of a polygon are arranged in the order of y_{min} to y_{max} & paired.

A (6,4) B(8,6) C(4,1) y=1 to 6.

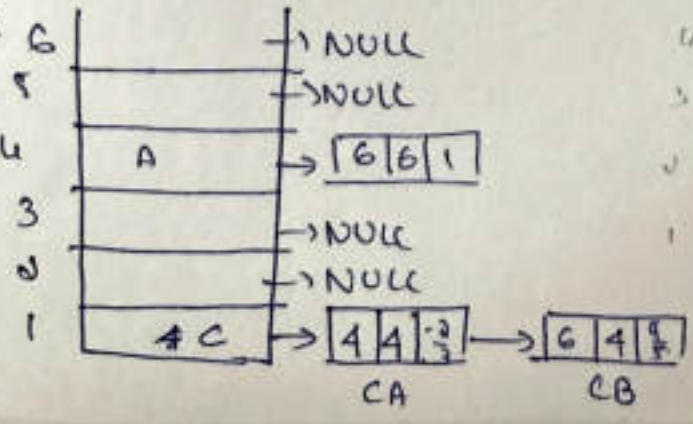
$\frac{6-4}{4-1} = \frac{-2}{-3}$ $\frac{8-4}{6-1} = \frac{4}{5}$

$\frac{8-6}{6-4} = \frac{2}{2}$

→ C(4,1)
A(6,4)
B(8,6).

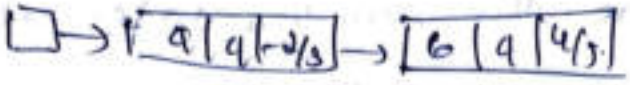


GET:



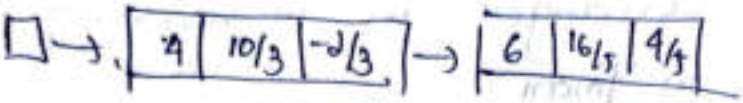
AET:

i=1



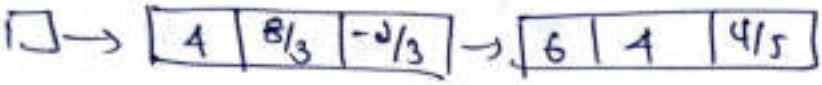
(1,1) (1,1).

i=2



(10/3, 2) (16/5, 2)

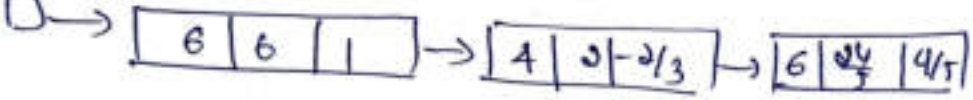
i=3.



(8/3, 3) (4, 3)

i=4

delete

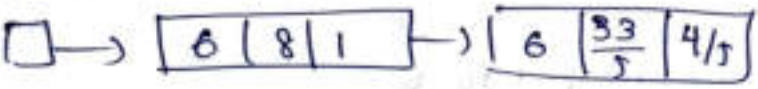


(6, 4) (24/5, 4)

i=5

(7, 5) (29/5, 4)

i=6.



(8, 6) (33/5, 6)

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VIMAL JYOTHI ENGINEERING COLLEGE
CHEMPERI, KANNUR

ANSWER BOOKLET

Internal Test / Assignment No. 3

Name of Student DIVA S PRN No. VNL19CS093

Roll No. 27 Batch/ Class : S6 CSE A

Course (Subject) COMPUTER GRAPHICS AND IMAGE PROCESSING Code CST304 Slot

Max Marks 60 Date of Examination : 13/Jul/2022 FN/AN

Academic Year: 2019-2023 Semester S6

Name of the Faculty hanlding the Subject : Asha Miss

Signature of Student:

Name & Signature of Invigilator

Question No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
a		1		9		3	7	7	6	6		9	1	
b													1	
c														
Total marks										36				

Date of Valuation: 16/07/22

For Instructions to candidate please refer back page

Asha Baby

Name & Signature of Examiner

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(8) Window (ω)

8 2 3 2 1

function. (f)

1 0 0 0 1 0 0 0 0.

→ In convolution first we need to rotate the window by 180°. Thus we get the result.

1 2 3 2 8.

→ Now we need to do zero padding, it is done by adding 5−1=4 zeroes on both left and right side of the function.

0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0.

→ Now we will move the window ~~by at at~~ by one along the function. and take the sum of products

x=0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0.

1 2 3 2 8

1×0+2×0+3×0+2×0+8×0=0.

x=1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0

1 2 3 2 8

=0

x=2 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0

1 2 3 2 8

=0

x=3 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0

1 2 3 2 8

=8

x=4 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0

1 2 3 2 8

=2

x=5 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0

1 2 3 2 8

=3.

Image processing software

They are used for technical and algorithmic processing of images.

Mass storage

It stores the ~~pixel~~ individual pixels of each image. There are 3 types of storage like temporary storages ~~on~~ etc.

Hardcopy

Computer always stores a ~~hardcopy~~ copy of its Images. HardCopy are always required

digital images

for this we use the Colour ~~digital TV~~ TV monit

③ The application of digital Image processing are

→ It is used in medical field

→ Eg: CT Scan.

X-ray imaging.

~~CT Scan~~ Infrared Imaging. etc.

→ ~~It is used in~~

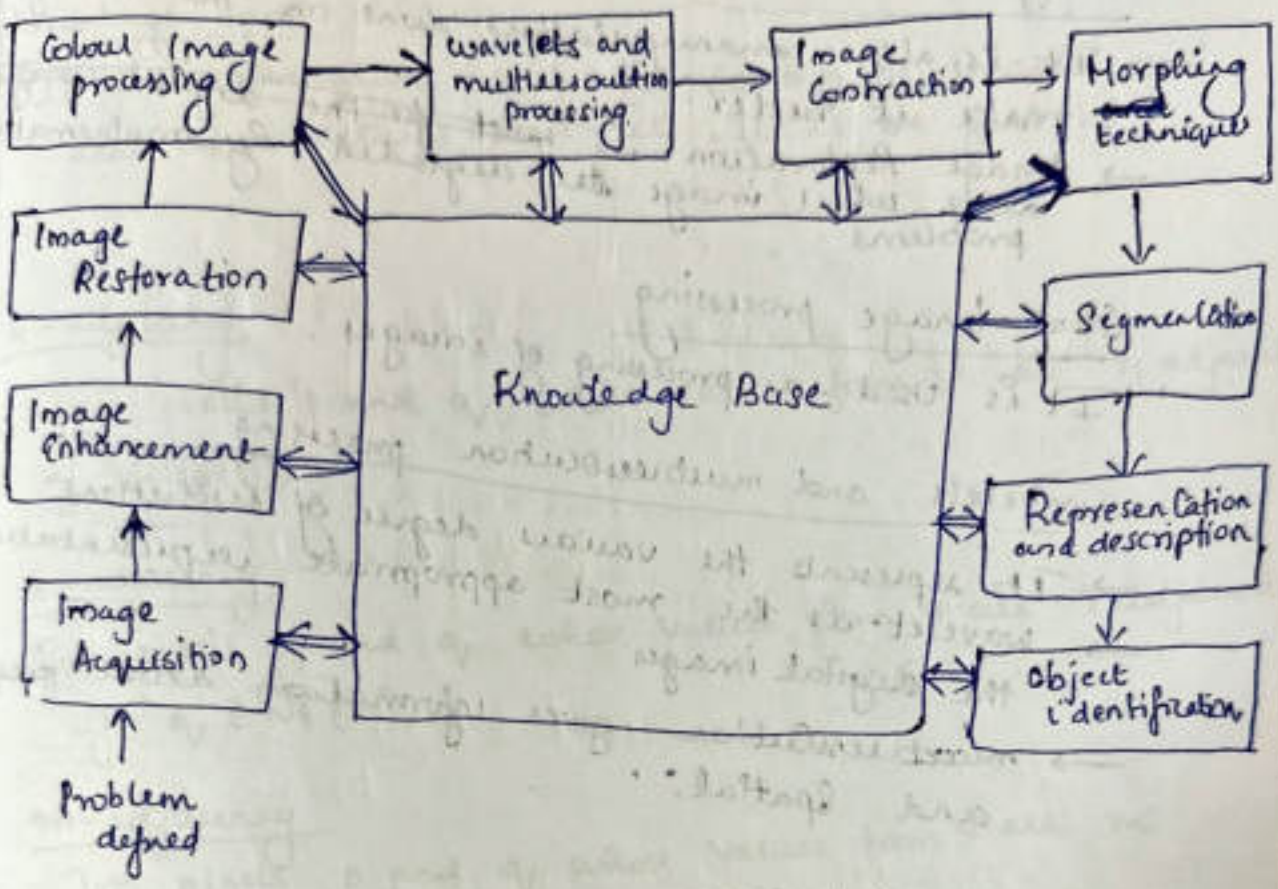


Image Acquisition

Here the image is obtained using cameras. There are various cameras used for obtaining suitable images. for Infared images we use Infrared camera. Sensitive Camera for normal image we use cameras which are sensitive to ~~Ultraviolet image~~ Visible Spectrum and for infrared images we use cameras which are sensitive to infrared ~~images~~.

Image Enhancement

Image enhancement is the manipulation of an image into a better one for specific requirement than the previous one. for example we increasing the brightness and changing contrast etc. so on. It brings forth the hidden details of an Image

Image Restoration

→ It is also manipulations done on the image to make it better.
→ Image Restoration is ~~must for the digital use of imag~~ done when image is degraded by mathematical problems.

Colour Image processing

It is used in processing of images.

wavelets and multiresolution processing

→ It represents the various degree of resolutions.
→ wavelet is the most appropriate representation of the digital images.
→ multiresolution gives information about frequency and spatial.

Image Contraction

→ It reduces the requirement for storing the images.
→ Image Contraction is becoming very famous as it is used in digital Image.

Morphing

It is a tool which is used to get the Components of an image.

Segmentation

It is the partitioning of an image into object.

Representation and description

Representation is the solution for ~~image~~ degradation
Description ~~is the~~ tells us about how different classes are organised and so on

Object identification

Here labels are given to the object.

Knowledge base

It gives information about the location of images and also shows details about it. It is the final step.

10) 4-adjacency

Two pixels p and q whose values from V are 4 adjacent if $q \in N_4(p)$

8-adjacency

Two pixels p and q whose values from V are 8 adjacent if $q \in N_8(p)$

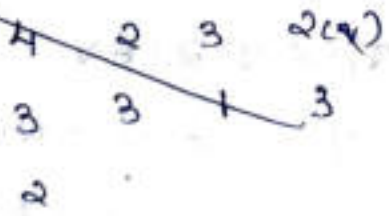
m-adjacency

Two pixels p and q whose values from V are m adjacent if

i) $q \in N_4(p)$ or

ii) $q \in N_D(p)$ and $N_4(p) \cap N_4(q)$ & V

4 path



4 path

4	2	3	2(q)
3	3	1	3
2	3	2	2
2 (p)	1	2	3

$V = \{1, 2\}$.

→ $N_4(2) = \{2, 1\} \in V$ $q = 1 \in N_4(2)$

→ $N_4(1) = \{3, 2\}$ where $2 \in V$ $q = 2 \in N_4(1)$

→ $N_4(2) = \{2, 3\}$ where $2 \in V$ $q = 2 \in N_4(2)$

→ $N_4(2) = \{2, 3, 1\}$ where $2, 1 \in V$ $q = 1 \in N_4(2)$

→ $N_4(1) = \{3\} \notin V$.

∴ There is no 4 path between p and q.

8 - adjacency

4	2	3	2(q)
3	3	1	3
2	3	2	2
2 (p)	1	2	3

$V = \{1, 2\}$

→ $N_8(2) = \{2, 1, 3\}$ where ~~$3, 1 \in V$~~ $2, 1 \in V$ $q = 1 \in N_8(2)$

→ $N_8(1) = \{2, 3\}$ where $2 \in V$ $q = 2 \in N_8(1)$

→ $N_8(2) = \{2, 3\}$ where $2 \in V$ $q = 2 \in N_8(2)$

→ $N_8(2) = \{1, 3, 2\}$ where $1, 2 \in V$ $q = 1 \in N_8(2)$

→ $N_8(1) = \{2, 3\}$ where $2 \in V$ $q = 2 \in N_8(1)$

The short path between p and q is 3

m path

$$\begin{bmatrix} 4 & 2 & 3 & 2 \\ 3 & 3 & 1 & 3 \\ 2 & 3 & 2 & 2 \\ 2 & 1 & 2 & 3 \end{bmatrix} \quad V = \{1, 2\}$$

i) $q_v \in N_4(p)$ or

ii) $q_v \in N_D(p)$ and $N_4(p) \cap N_4(q_v) \neq V$

→ $N_4(2) = \{2, 1\} \in V \quad q_v = 1 \in N_4(2)$

→ $N_4(1) = \{3, 2\}$ where $2 \in V \quad q_v = 2 \in N_4(1)$

→ $N_4(2) = \{2, 3\}$ where $2 \in V \quad q_v = 2 \in N_4(2)$

→ $N_4(2) = \{2, 1\} \in V \quad q_v = 1 \in N_4(2)$

→ $N_4(1) = \{3\} \neq V$.

∴ $N_D(\bullet) = \{2, 3\}$ where $2 \in V$

$q_v = 2, \in N_D(1)$

and

$N_4(q_v) = \{3\} = N_4(2)$

$N_4(\bullet) \cap N_4(2) = \{3\} \neq V$.

∴ There exist a path p to q_v.

The shortest path is 5

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11)

$$\begin{bmatrix} 11 & 13 & 9 & 9 \\ 10 & 11 & 10 & 14 \\ 9 & 13 & 10 & 9 \\ 1 & 10 & 11 & 13 \end{bmatrix}$$

The highest value among all are 19

So $2^5 = 32$ which is the nearest highest value.

∴ No of Grey levels is from 0 to 15

Grey level	0	1	2	3	4	5
No of pixels	3	3	3	4	1	

12) Log transformation and Power-law transformations is used for the enhancement of images.

For Log transformation $S = c \log(r+1)$ where c is given value and r is the image pixel.

For power-law transformation $S = c r^{\gamma}$ where c and γ values are given and r is the value of the image pixel. Both these are applied in a image

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⑥

	0	1	2	3	4
0	0	1	3	3	4
1	5	6	7	8	4
2	4	3	2	1	3
3	2	7	6	⑤	3
4	1	5	3	7	6

average filter

$$\frac{1}{9}\begin{bmatrix}1&1&1\\1&1&1\\1&1&1\end{bmatrix} \times \begin{bmatrix}2&1&3\\6&5&3\\3&7&6\end{bmatrix}$$

$$= \frac{1}{9}\left[1\times2+1\times1+3\times1+6\times1+5\times1+3\times1+3\times1+7\times1+6\times1\right]$$

$$= \frac{1}{9}\times 36 = 4.$$

5 is changed to 4

median filter

→ rearging in ascending order.

1 2 3 3 3 5 6 6 7

3 is the median value

so 5 is changed to 3.

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(14) Spatial resolution is used in Image clarity.
An image with same resolution will be seen with reduced clarity in big screen and with increased clarity in small screen

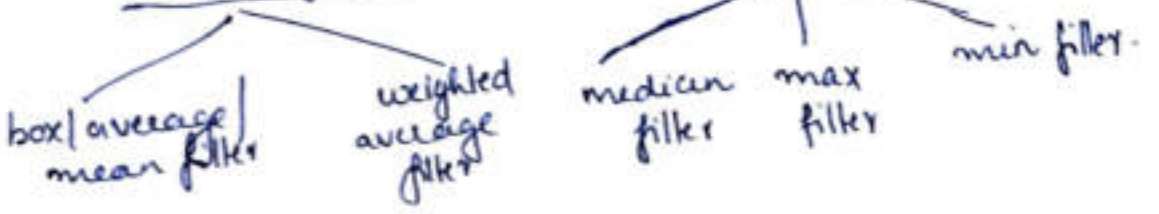
Gray level resolution

→ It is the bits per pixels
→ Gray level is the different shades of grey visible on the grey scale.

(2) Sampling is the digitalization of Grey levels
quantization is the digitalization of amplitude.
Sampling is done prior to quantization
quantization is done after sampling.
~~In case of t~~.

13)(a) Smoothning filters are used to reduce the noise and ~~contrast~~ brightness of the image.
Sharpening filter is used to reduce the sharpness of the image

(b) The different types of smoothning filters are
linear filter and non linear filter



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VIMAL JYOTHI ENGINEERING COLLEGE
CHEMPERI, KANNUR

ANSWER BOOKLET

Internal Test / ~~Assignment~~ No. 4

Name of Student Hasipriya.M PRN No. VML19CS060

Roll No. 31 Batch/ Class : S6CSE A

Course (Subject) Computer graphics and image processing Code CST 304 Slot

Max Marks 60 Date of Examination : 20/07/2022 ~~FN~~/AN

Academic Year: 2022 Semester Sixth

Name of the Faculty handling the Subject : Ms. Asha Baby

Signature of Student: Hasipriya

Athira M. Thomas 20/7/22
Name & Signature of Invigilator

Question No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
a	3	3			2		4	3	5	7			4	7
b														
c														
Total marks												40		

Date of Valuation: 27/07/2022

Asha Baby
Name & Signature of Examiner

For Instructions to candidate please refer back page

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Computer graphics is the art of drawing pictures on computer screen.

There are two types of computer graphics

→ Interactive computer graphics

→ Non-interactive computer graphics

There are several applications ~~in comput~~ of computer graphics. They are.

→ Education and training

→ Use in biology

→ Computer art

→ Educational software

→ Visualization

→ Architecture

Education and training

Computer graphics can be used in the field of educa

For education and training ~~ca~~ purpose, we can make graphical representation of objects. This helps the students to study well.

Biology

We can make the graphical view of molecule in our body. So that students can understand well.

Computer art

We can use computer graphics in computer art

Educational Software

We can create educational softwares for students. It ~~makes their~~ helps the students to study.

Visualization

Computer graphics ~~can~~ are used ~~in the fie~~ for ~~a~~ ~~level~~ television applications.

We can use computer graphics in entertainment purpose

Architecture

Computer graphics can be used in architecture. This helps the architect while designing a building e

2)

Raster scan display	Random scan display
→ Picture definition is stored in a memory space called refresh buffer or frame buffer.	→ Picture definition is stored as set of line drawing commands
→ Less resolution	→ High resolution
→ Refresh rate is 60 to 80 frames per second	→ Refresh rate is depends on number of lines.

5) Image segmentation

Image segmentation is the process of partitioning an image.

It is the most hardest part of image processing

Segmentation of an image ~~is based on,~~ is done by,

→ Discontinuity

→ Similarity

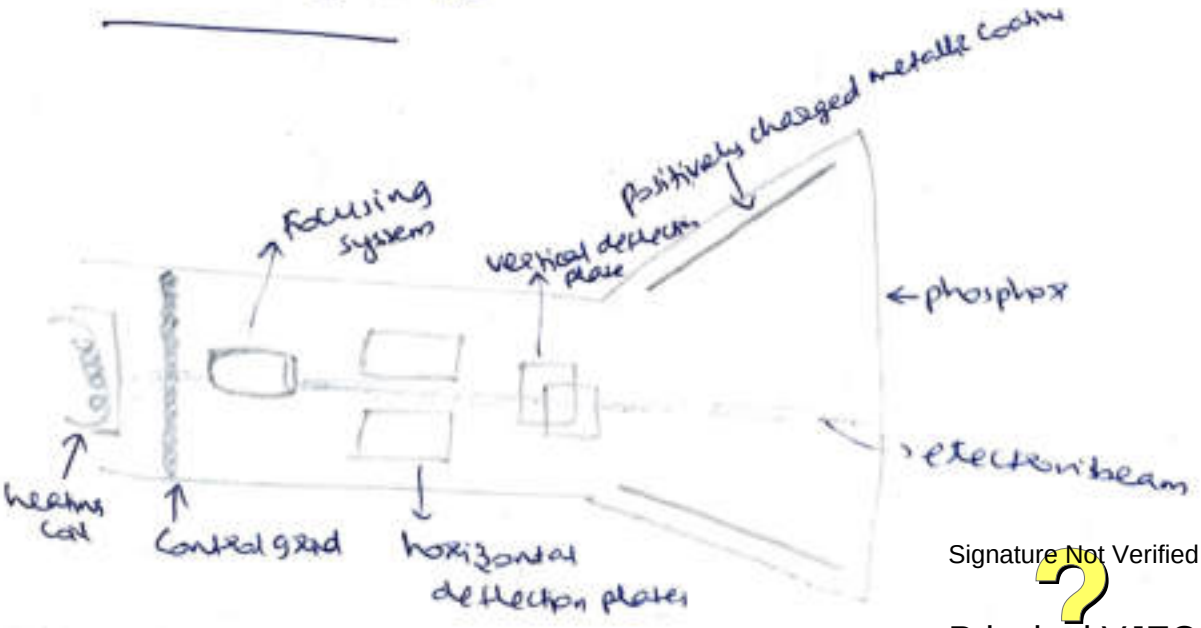
Discontinuity

Segmentation can be done when there is ~~an~~ a ~~difference in the intensity of the pixel~~ Sudden changes in the intensity value. ~~of p~~

Similarity

Segmentation based on similarity

7) Cathode Ray Tube



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A beam of ~~et~~ electron emitted by an electron gun passes through a focusing and accelerating system that direct the ~~b~~ electrons ~~towards~~ through horizontal and vertical deflection plates in to a specified position in the phosphor coated screen.

The point at which electron ~~collid~~ touches in the phosphor coated screen ~~emit~~ emit a small spot of light.

The intensity the light depends on ~~the~~ the no. of ~~ph~~ electrons striking at that point.

The positively charged metallic coating helps the electrons ~~to~~ ~~st~~ not to repel each other.

The voltage ~~of~~ of electrons ~~is~~ is controlled by control grid.

8)

$P_0 = 2\Delta y - \Delta x$

$P_{k+1} = P_k + 2\Delta y$ (if $P_k < 0$)

$P_{k+1} = P_k + 2\Delta y - 2\Delta x$ (if $P_k > 0$)

k	P_k	~~x_{k+1}, y_{k+1}~~ (x_{k+1}, y_{k+1})

$\Delta x = 12 - 1 = 11$, $2\Delta x = 22$

$\Delta y = 14 - 1 = 13$, $2\Delta y = 26$

$P_0 = 26$

if ~~P_k~~ P_k is greater than zero then (x_{k+1}, y_{k+1})

if P_k is less than zero then (x_{k+1}, y_k)

7)

K	P_k	(x_{k+1}, y_{k+1})
0	15	(2,1)
1	19	(3,3)
2	23	(4,4)
3	27	(5,5)

$P_1 = P_0 + 2\Delta y - 2\Delta x$
$= 15 + 4$
$= 19$

$P_2 = 19 + 2\Delta y - 2\Delta x$
$= 19 + 4$
$= 23$

$P_3 = 23 + 2\Delta y - 2\Delta x$

8)

$P_0 = 2\Delta y - \Delta x$

$P_{k+1} = P_k + 2x_{k+1} + 1$ (if $P_k < 0$)

$P_{k+1} = P_k + 2x_{k+1} + 1 - 2y_{k+1}$ (if $P_k > 0$)

$\Delta y = 13$
$\Delta x = 11$

$P_0 = 26 - 11$
$= 15$

if $P_k > 0$, $\Rightarrow (x_{k+1}, y_{k+1})$ and if $P_k < 0$ (x_{k+1}, y_k)

K	P_k	(x_{k+1}, y_{k+1})	$2x_{k+1}$	$2y_{k+1}$
0	15	2,1	4	2
1	18	3,1	6	2

$P_0 = 2\Delta y - \Delta x = 26 - 11 = 15$

$P_1 = P_0 + 4 + 1 - 2 = 15 + 5 - 1 = 19$

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9) $P_0 = 1 - x$

~~$P_k = p$~~

$P_{k+1} = P_k + 2x_{k+1} + 1$ (if $P_k < 0$)

$P_{k+1} = P_k + 2x_{k+1} + 1 - 2y_{k+1}$ (if $P_k > 0$)

if $P_k < 0$ then the next point will be (x_{k+1}, y_k)

if $P_k > 0$ then the next point will be (x_{k+1}, y_{k-1})

k	P_k	(x_{k+1}, y_{k+1})	$2x_{k+1}$	$2y_{k+1}$
0	-7	(1, 8)	2	16
1	-4	(2, 8)	4	16
2	1	(3, 7)	6	14
~~3~~	~~2~~	(4, 6)	8	12
3	-7	(4, 7)	8	14
4	-12	(5, 7)	10	14
5	-15	(6, 7)	12	14
6	-16	(7, 7)	14	14

$P_0 = 1 - x = 1 - 8 = -7$

$P_1 = P_0 + 2 + 1 = -7 + 3 = -4$

~~$= -7 + 3 = -4$~~

$P_2 = P_1 + 4 + 1 = -4 + 5 = 1$

$P_3 = P_2 + 6 + 1 - 14 = ~~21 = 22~~$

$= 1 + 7 - 14 = 8 - 14 = -7$

$P_4 = ~~22~~ -7 + 8 +$

$- 14$

$= 2 - 14 = -12$

$P_5 = -12 + 10 + 1 -$

$= -1 - 14$

$= -15$

$P_6 = -15 + 12 + 1 -$

$-15 + 13 -$

$= -16$

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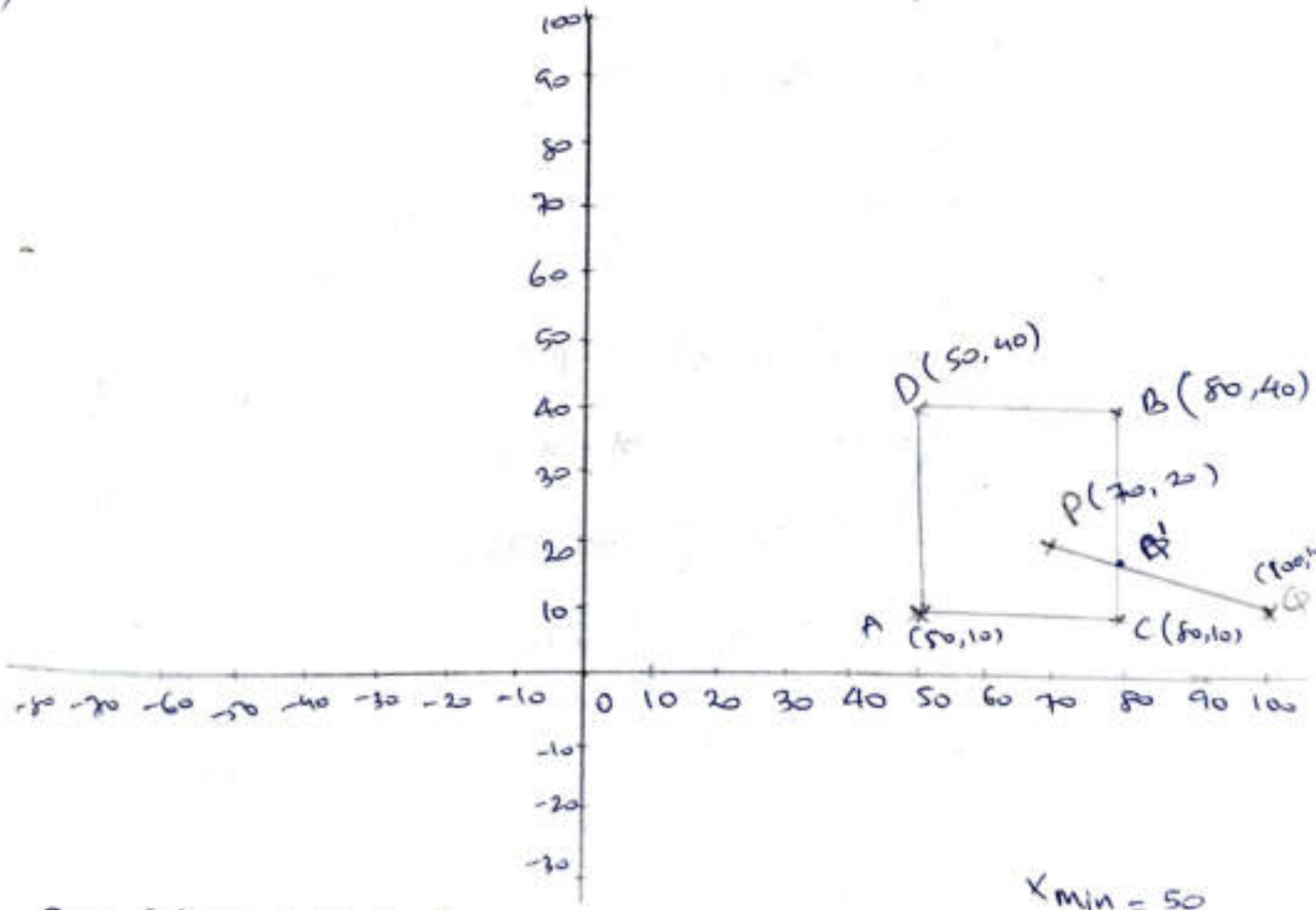
First quadrant (x, y)

(7, 7)
(6, 7)
(5, 7)
(4, 7)
(3, 7)
(2, 8)
(1, 8)

10)



For P(~~70~~, ~~40~~ 20)

$X_4 = X - X_{min} = 70 - 50 = 20 \Rightarrow 0$

$X_3 = X_{max} - X = 80 - 70 = 10 \Rightarrow 0$

$X_2 = Y - Y_{min} = 40 - 20 = 20 \Rightarrow 0$

$X_1 = Y_{max} - Y = 10 - 20 = -10 \Rightarrow 1$

$X_{min} = 50$

$X_{max} = 80$

$Y_{max} = 40$

$Y_{min} = 10$

P ⇒ 1000

for Q (100, 10)

$x_4 = x - x_{min} = 100 - 50 = 50 \Rightarrow 0$

$x_3 = x_{max} - x = 80 - 100 = -20 \Rightarrow 1$

$x_2 = y - y_{min} = 10 - 10 = 0 \Rightarrow 0$

$x_1 = y_{max} - y = 40 - 10 = 30 \Rightarrow 0$

Q ⇒ 0010

Performing AND operation

```
1000
0010
----
0000
```

Let a point $P'(x, y) \Rightarrow P'(80, y)$

$y = m x_1 + m(x - x_1)$

$y = 20 + \frac{-6}{5}(80 - 70)$

$= 20 + \frac{-6}{5} \times 10^2$

$= 20 - 12$

$= 8$

$P'(80, 8)$

Let the point $Q'(x, y) \Rightarrow Q'(x, y)$

$y = y + m(x - x_1)$

$= 10 + \frac{-3}{5}(100 - 70)$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{10 - 40}{100 - 70}$

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$= 10 + \frac{6}{5} \times -20$

$= 10 + 24$

$= 34$

$Q' = (80, 34)$

$m = -\frac{3}{5}$

Here we have to clip the line $Q'Q$.

$Q'(x, y) \Rightarrow Q'(80, y)$

$Q(100, 10)$

$y = y_1 + m(x - x_1)$

$= 10 + -\frac{3}{5}($

Here we have to clip the line $Q'Q$

$Q'(x, y) \Rightarrow Q'(80, y)$

$m = \frac{10 - 20}{100 - 70}$

$= \frac{-10}{30}$

$= -\frac{1}{3}$

$y = y_1 + m(x - x_1)$

$= 10 + -\frac{1}{3}(80 - 100)$

$= 10 + \frac{1}{3} \times 20$

$= 10 + \frac{20}{3}$

$= 16.66$

$Q'(80, 16.66)$

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13) Log transformation

Transformation can be performed on an image for enhancing the image.

Enhancement of of an image is to highlight an image so that the resultant image is ~~more~~ better than the real image.

There are ~~two types~~ three types of transformation.

→ Log transformation
→ Linear transformation
→ Power-law transformation

Log-transformation

There are two types of log transformation.

→ Log-transformation
→ Inverse-log transformation

$$S = C \log(r+1)$$

Power-law transformation

It is a method used for the transformation of an i

for $S = Cr^{\gamma}$

Contrast stretching

Contrast stretching is a method of enhancement of image.

Here maximum intensity of an image is stretched

and minimum intensity of the image is stretched to its minimum.

14) There are two types of filters.
→ Smoothening
→ Sharpening

Smoothening filter

~~It is~~ They are used for ~~noise~~ making blurred and noise reduction in images.
It is of two types.
→ Linear smoothening
→ Non-linear smoothening

Linear smoothening

It is of two types.
(i) Box filter / mean filter

It is used for blurred and noise reduction in images.
Noise reduction - Removal of of unwanted things
blurring - removal of small parts.
filter mask of box filter is

$\frac{1}{9}$

1	1	1
1	1	1
1	1	1

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Here the intensity of the pixel is multiplied with same coefficients.

~~(ii) Weighted Averaging filter~~

~~It is~~

Application

→ Noise reduction

(ii) Weighted averaging filter

~~It is to~~ while using box filter, blurring may occur in the images. For ~~this~~ solving this problem weighted averaging filter is used.

filter mask is,

$\frac{1}{16}$

1	2	1
2	4	2
1	2	1

Here the value in the column is greater than its adjacent columns.

Non-linear Smoothing filter

It is of three types.

→ Median

→ Max

→ Min.

Median filter

The intensity value is replaced with ~~minimum value~~ median value in the window.

Max filter

The intensity value is replaced with maximum value in the window.

Min filter

The intensity value is replaced with minimum value in the window.

Sharpening filter

This filter highlight the object in the image.

8)

$P_0 = 2\Delta x - \Delta y$

$P_{k+1} = P_k + 2\Delta x$ (if $P_k < 0$)

$P_{k+1} = P_k + 2\Delta x - 2\Delta y$

$\Delta x = 11$, $\Delta y = 13$

$P_0 = 22 - 13 = 9$

$P_1 = 9 + 11 - 26$
$= 20 - 26 = -6$

if $P_k > 0$ (x_{k+1}, x_{k+1})
if $P_k < 0$ (x_{k+1}, x_k)

k	P_k	x_{k+1}, y_{k+1}
0	9	(2,2)
1	-6	(3,2)
2	16	(4,3)
3	12	(5,4)
4	8	(6,5)
5	4	(7,6)

$P_2 = -6 + 22$
$= 16$

$P_3 = 16 + 22 - 26$
$= 16 + -4$
$= 12$

$P_4 = 12 + 22 - 26$
$= 8$

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Assignment Cover Page

Name of the student :- Antony Thomas

PRN VMJ19CSD033 | Admission No. 6257

Subject Name :- Computer Graphics & Image Processing | Subject Code:- CST 304

Assignment Title/No : 2

Name of the faculty: Ms. Asha Baby

Assignment Submitted on 07/07/2022

Late submission rules : Max mark will reduced to 50% for 1-5 working day's delay, no mark will be awarded thereafter.

I am hereby confirming that this assignment is my own and I haven't adopted any unfair means in any steps of its preparation to enhance my performance in this assignment.

Antony Thomas
Sign with Name

Date : 07/07/2022

Assignment subdivision	Maximum Mark	Marks awarded	Remarks
A	10	10	good
B	5	5	good
C			

Feed back/suggestions :

Asha Baby
Name and sign of the faculty

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ASSIGNMENT-2

6) A 4x4, 4 bits/pixel original image is given by:

$$\begin{bmatrix} 10 & 12 & 8 & 9 \\ 10 & 12 & 12 & 14 \\ 12 & 13 & 10 & 9 \\ 14 & 12 & 10 & 12 \end{bmatrix}$$

1. Apply histogram equalization to the image by rounding the resulting image pixels to integers.
2. Sketch the histogram of the of the original image and the histogram equalized image.

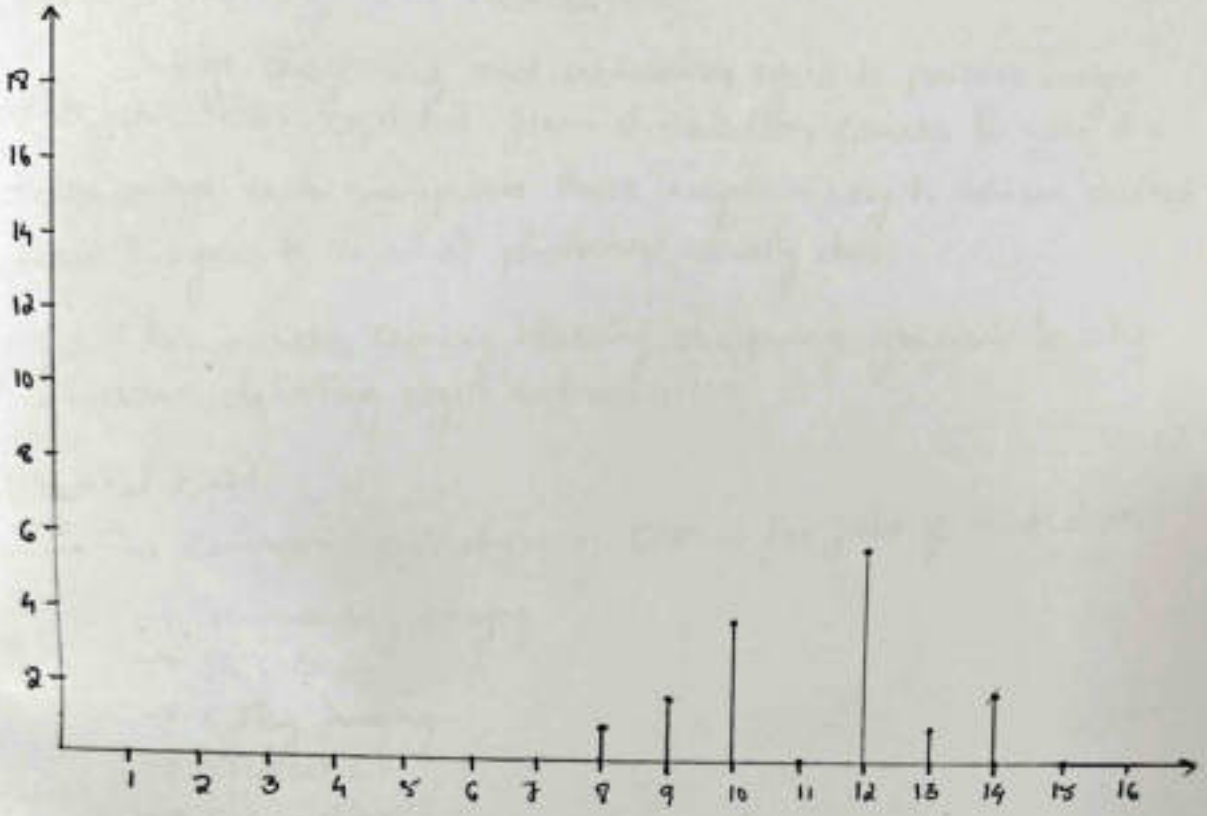
i)

Pixel Intensity	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of Pixels	0	0	0	0	0	0	0	0	1	2	4	0	6	1	2	0

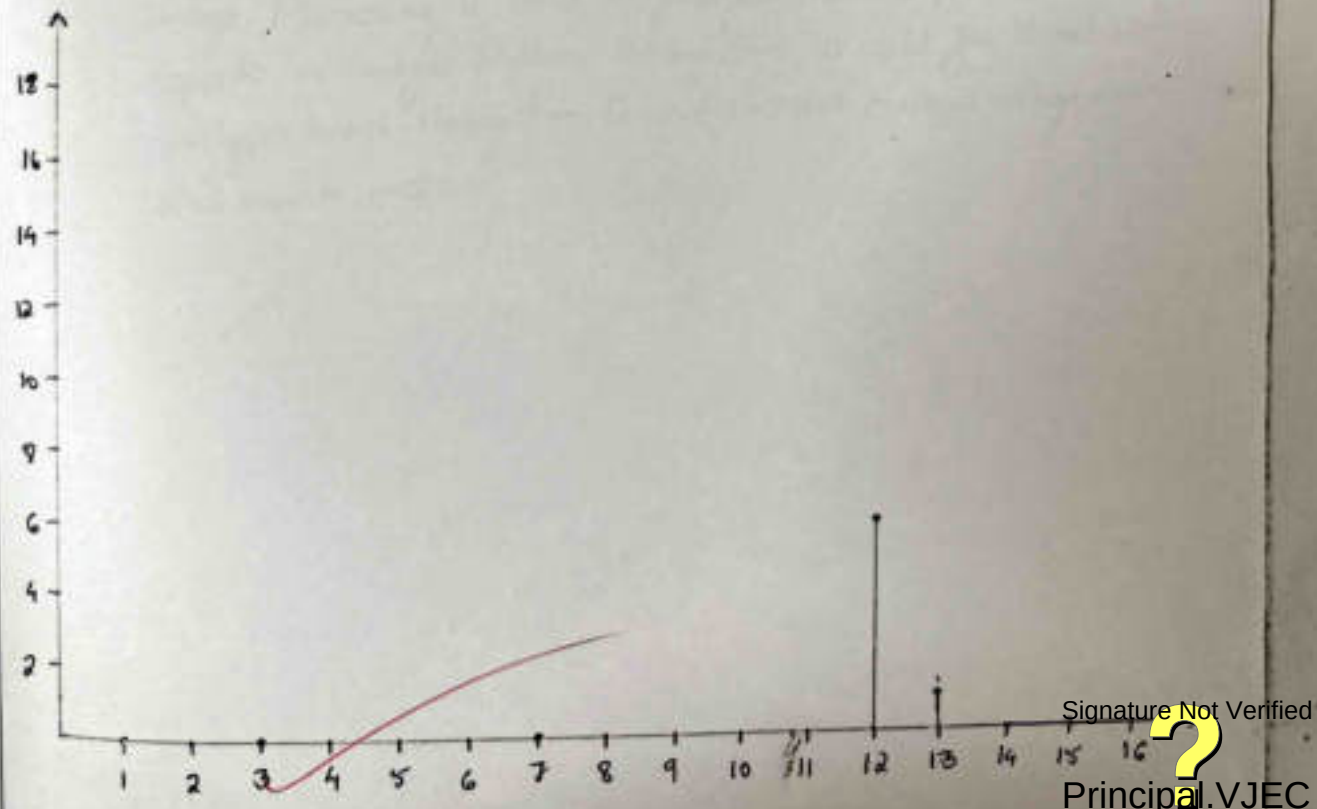
Gray Level r_k	No. of Pixels n_k	PDF $p(r_k) = n_k/n$	S_k	$S_k \times 15$	Histogram Equalization
0	0	0/16 = 0	0	0	0
1	0	0/16 = 0	0	0	0
2	0	0/16 = 0	0	0	0
3	0	0/16 = 0	0	0	0
4	0	0/16 = 0	0	0	0
5	0	0/16 = 0	0	0	0
6	0	0/16 = 0	0	0	0
7	0	0/16 = 0	0	0	0
8	1	1/16 = 0.0625	0.0625	0.9375	1
9	2	2/16 = 0.125	0.1875	2.8125	3
10	4	4/16 = 0.25	0.4375	6.5625	7
11	0	0/16 = 0	0.4375	6.5625	7
12	6	6/16 = 0.375	0.8125	12.1875	12
13	1	1/16 = 0.0625	0.875	13.125	13
14	2	2/16 = 0.125	1	15	15
15	0	0/16 = 0	1	15	15

$n = k$

2) Histogram of Original Image:



Histogram of Equalized Image:



5) Give any three applications of digital image processing:

→ Image Sharpening and Restoration:

Image sharpening and restoration refers to process images that have been captured from the modern camera to make it a better image or to manipulate those images in way to achieve desired result. It refers to do what photoshop usually does.

This includes, Zooming, blurring, sharpening, grayscale to color conversion, detecting edges and vice versa.

→ Medical Field:

→ The common applications of DIP in the field of medical is:

→ Gamma ray imaging.
→ PET Scan.
→ X Ray Imaging.
→ Medical CT
→ UV Imaging.

→ Pattern Recognition:

→ It is a part of DIP that involves AI and Machine Learning. Image Processing is used to find out various patterns and aspects in images. Pattern Recognition is used for Handwriting analysis, Image Recognition, Computer-aided medical diagnosis and much more.

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