② a) Find the transformation matrix of mirror Reflection about the line $2x - 3y + 3 = 0$. you do not need multiply matrices. Use homogenous.

$$= M$$

Soln:

Given, $2x - 3y + 3 = 0$

$$\Rightarrow -3y = -2x - 3$$

$$\Rightarrow 3y = 2x + 3$$

$$\therefore y = \frac{2}{3}x + 1$$

Here, $m = 2/3$, $c = 1$

Now, $\tan\theta = m$

$$\Rightarrow \tan\theta = 2/3$$

$$\Rightarrow \theta = \tan^{-1}(2/3)$$

$$\therefore \theta = 33.69°$$

$$\therefore 90° - \theta = (90° - 33.69°)$$

$$= 56.31°$$

Now,

transformation matrix, $\bar{R}(95-\theta)$

$$M = \underset{T(0,1)}{\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}} \begin{bmatrix} \cos 56.31 & -\sin 56.31 & 0 \\ -\sin 56.31 & \cos 56.31 & 1 \\ 0 & 0 & \end{bmatrix}$$

$$\underset{M_y}{\begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}} \underset{R(95-\theta)}{\begin{bmatrix} \cos 56.31 & -\sin 56.31 & 0 \\ \sin 56.31 & \cos 56.31 & 0 \\ 0 & & 1 \end{bmatrix}} \underset{T(0,-1)}{\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}}$$

A.

b) Consider two straight line L1 and L2 which are represented by the equation $x + y - 6 = 0$ and $x - y + 4 = 0$ respectively. you want to align L1 and L2 by performing 2D translation and rotations. write down the corresponding composite transformation matrix ~~for reflection~~.

1) b)

Given,

$$A = (3, -9, 7, -1)$$

$$B = (0, -3, -7, 2)$$

$$C = (4, 4, 4, 4)$$

For Homogenous point A,

$$= (3, -9, 7, -1)/(-1)$$

$$= (-3, 9, -7, 1)$$

For Homogenous point B,

$$= (0, -3, -7, 2)/2$$

$$= (0, -3/2, -7/2, 1)$$

For Homogenous point C,

$$= (4, 4, 4, 4)/4$$

$$= (1, 1, 1, 1)$$

Now, $\overline{AB} = B - A$

$$= (0, -3/2, -7/2, 1) - (-3, 9, -7, 1)$$

$$= (0+3, \frac{-3}{2} - 9, -7/2 + 7, 1-1)$$

$$= \left(3, -21/2, 7/2, 0\right)$$

Again, $\overline{CB} = B - C$

$$= \left(0, -3/2, -7/2, 1\right) - (1,1,1,1)$$

$$= \left(-1, -5/2, -9/2, 0\right)$$

And, $\overline{AC} = C - A$

$$= (1,1,1,1) - (-3, 9, -7, 1)$$

$$= (4, -8, 8, 0)$$

Now,

$$3\overline{AB} - 2\overline{CB} + 5\overline{AC}$$

$$= 3\left(3, -21/2, 7/2, 0\right) - 2\left(-1, -5/2, -9/2, 0\right)$$

$$+ 5\left(4, -8, 8, 0\right)$$

$$= \left(9, \frac{-63}{2}, 21/2, 0\right) - (-2, -5, -9, 0)$$

$$+ (20, -40, 40, 0)$$

$$= \left(9+2+20, \; \frac{-63}{2}+5-40, \; \frac{21}{2}+9+40, \; 0-0\pm0\right)$$

$$= \left(31, \; -133/2, \; 119/2, \; 0\right)$$

2. $\overline{AB} \cdot \overline{CA}$

Now, for previous solution,

$$\overline{CA} = A-C$$

$$= (-3,9,-7,1) - (1,1,1,1)$$

$$= (-4, 8, -8, 0)$$

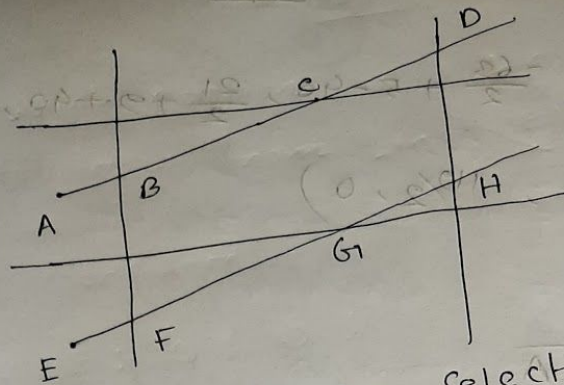$$\overline{AB} = \left(3, \; -21/2, \; 7/2, \; 0\right)$$

Now, $\overline{AB} \cdot \overline{CA}$

$$= \left(3, \; -21/2, \; 7/2, \; 0\right) \cdot \left(-4, 8, -8, 0\right)$$

$$= \left(-12 - 84 - 28 + 0\right)$$

$$= \quad -124 .$$

3.

→ which portion will be selected to $\overline{AD}$
draw from Line AD.

use
TBRL

Soln; Consider AD.

A: 0001

D: 1010

Both end point are not 0000
So, it can not trivially accepted.

Again, AND gives Zero with A and D.

$$\begin{array}{c} 0\ 0\ 0\ 1 \\ 1\ 0\ 1\ 0 \\ \hline 0\ 0\ 0\ 0 \end{array}$$

So can not trivially rejected.

select the pant A and set fourth bit
Zeno. new pant B is found. (ii)

    B: 0 0 0 0

    D: 1 0 1 0

Both end pant are not 0 0 0 0.
we can perform AND operation,

        0 0 0 0
        1 0 1 0
        ―――――――
        0 0 0 0

it con not trivially rejected.

    Select the point D and set 1st bit
    Zeno. New pant G is found.

    B: 0 0 0 0 0

    e: 0 0 0 0

so, it con accepted.

⊛ ii) Which portion will be selected
to draw from Line EH ?

Soln: Consider EH

E: 0 1 0 1 0 0 0 0

H: 0 0 1 0 0 1 0 0 0 0 0

Both end points are not 0000
it can not trivially accepted.
Now AND Gives Zero E with H.

$$
\begin{array}{cccc}
0 & 1 & 0 & 1 \\
0 & 0 & 1 & 0 \\
\hline
0 & 0 & 0 & 0 \\
\end{array}
$$

So, it can not trivially rejected.
Select the point H and set third bit
Zero. New point G is found.

E: 0 1 0 1

G: 0 0 0 0

Both end points are not 0000
So, it can not trivially accepted.

Now, AND Gives Zero with E & G.

```
    0  1  0  1
    0  0  0  0
  _____
    0  0  0  0
```

it Can not trivially rejected. select the
E part,

E: 0 0 0 1

G: 0 0 0 0 0

Both end point are not accepted.
so it Can not trivially accepted.

Again, AND Gives Zero.

```
    0  0  0  1
    0  0  0  0
  _____
    0  0  0  0
```

So, it Can not trivially rejected.
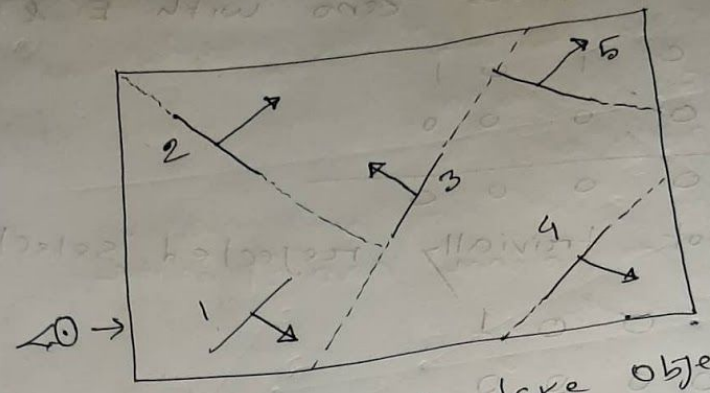Now, select point E and set fourth bit
is Zero.

E: 0 0 0 0
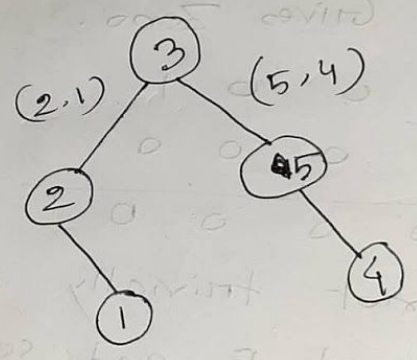
G: 0 0 0 0

Both are Zero so it Can
trivially accepted.

④

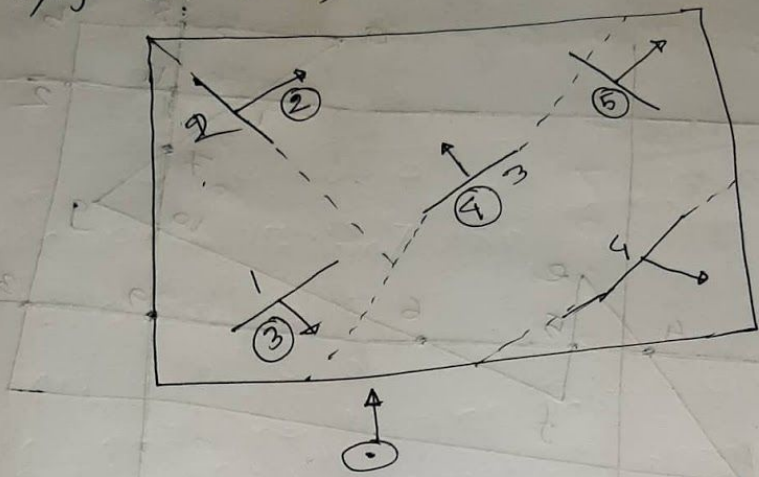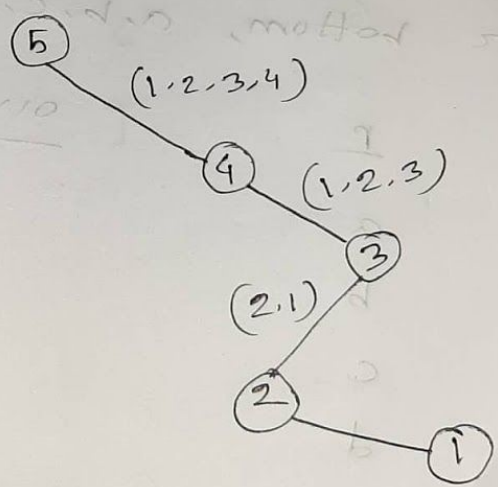1) Draw BSP tree and take object 3 as root. then display BSP tree.

soln:

(2,1)   ③   (5,4)

order: 5 → 4 → 3 → 2 → 1

Displaying BSP tree,
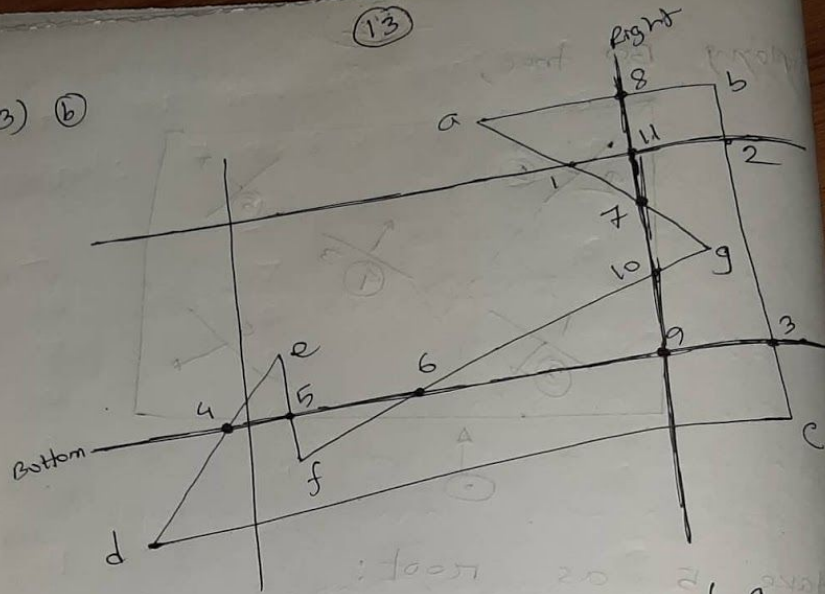

ii) take 5 as root:

5 ——— (1,2,3,4)
   4 ——— (1,2,3)
      3
      (2,1)
         2 ——— 1

order: 5 → 4 → 3 → 2 → 1

3) (b)

soln: For bottom, a, b, c, d, e, f, g

		output:
s	r	a
g	(2,5,1)	b
a	a	3
b	b	–
c	c	4, e
d	d	5
e	e	6, g
f	f	
	g	

Bottom

d   e   f   4   5   6   Right

(14)

For right, sort angle moving the for
output of previous iteration,
a, b, 3, 4, e, 5, 6, g

S	P	output:
g	a	7, a
a	b	8
b	3	-
3	4	9, 4
4	e	e
e	5	5
5	6	6
6	g	10

For tor Privious iteration of
output: 7, a, 8, 9, 4, e, 5, 6, 10

S	P	output
		7
10	7	a1
7	a	—
a	8	11.9
8	9	4
9	4	e
4	e	5
e	5	6
5	6	10
6	10	

※ Hene,

$$\vec{V} = 1/7\hat{i} - 3\hat{j} + c\hat{k}$$

Now, $a = 6$, $b = -3$, $c = 1/7$

Now, $\alpha = \tan^{-1}(b/c)$

$$= \tan^{-1}\left(\frac{-3}{1/7}\right)$$

$$= -87.28$$

Again, $\beta = \tan^{-1}\left(\frac{-a}{\sqrt{b^2 + c^2}}\right)$

$$= \tan^{-1}\left(\frac{-6}{\sqrt{(-3)^2 + (1/7)^2}}\right)$$

$$= -63.41 \quad A.$$