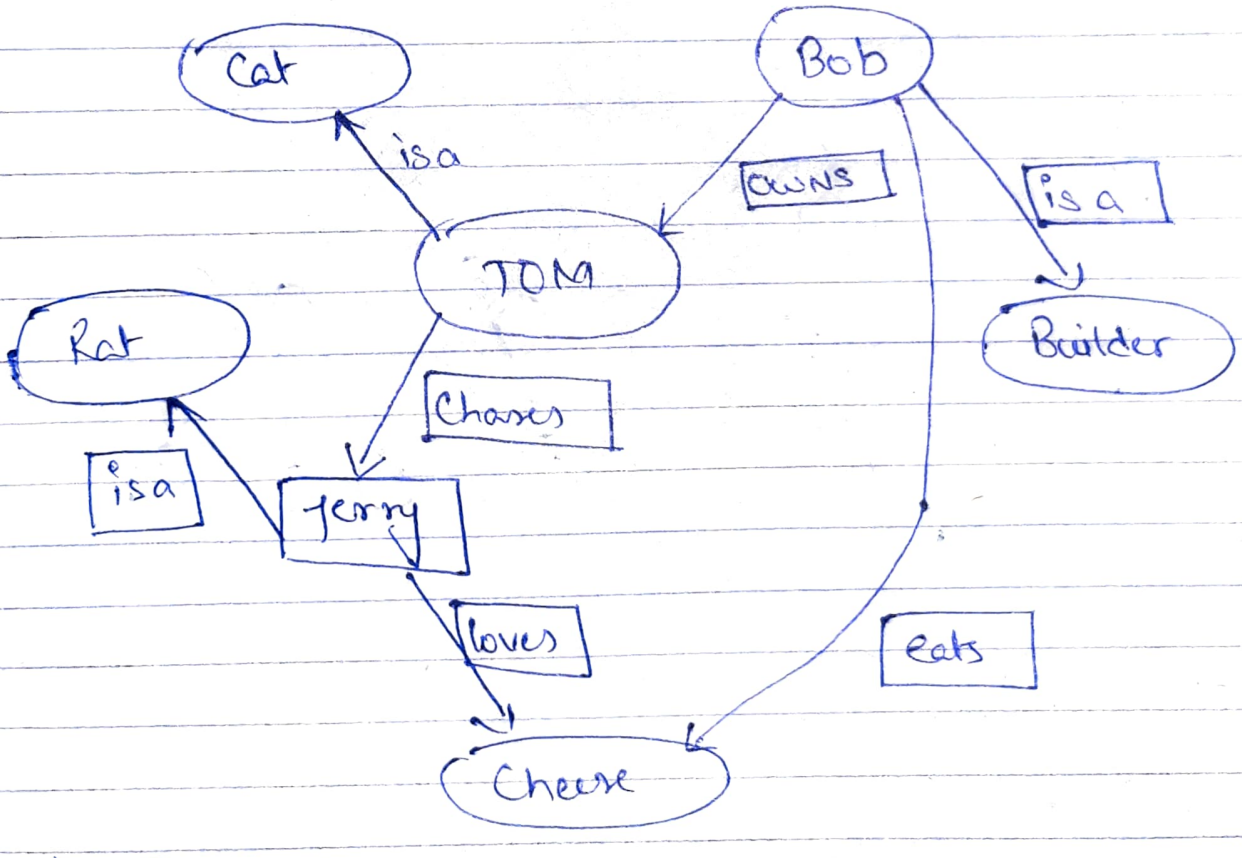
(2) a) Graph:-

b) Semantic net

→ • A Semantic net is a graph consisting of nodes that are connected with edges

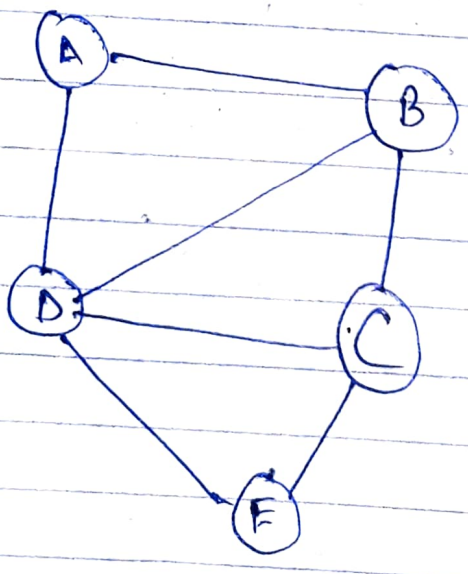
- where each nodes represent objects
- The link represent relationship between object
- The link usually represents the nature of the relationship

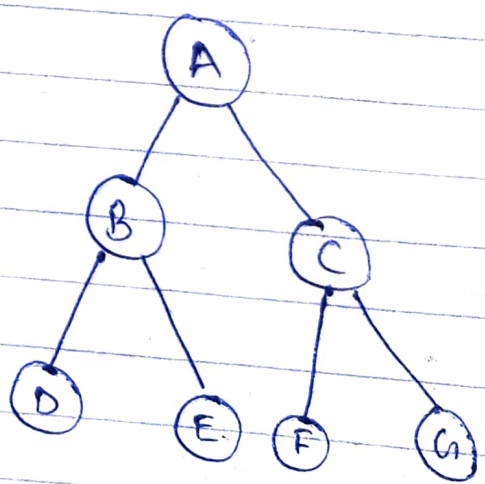


c) Semantic tree

→ A Semantic tree is a kind of Semantic ~~tree~~ net which have the following property:-

- Each Node Should have exactly one parent (except root Node) and one or more child node
- One node doesn't have any parent that is the root node. while Searching a Semantic tree we Start from root node. This is because the root node typically represents the Starting point of the problem.
- Some nodes doesn't have any child node those node are called leaf node. one or more leaf node are called goal nodes.
- In Semantic tree an edge that connects two edges that are called branch.



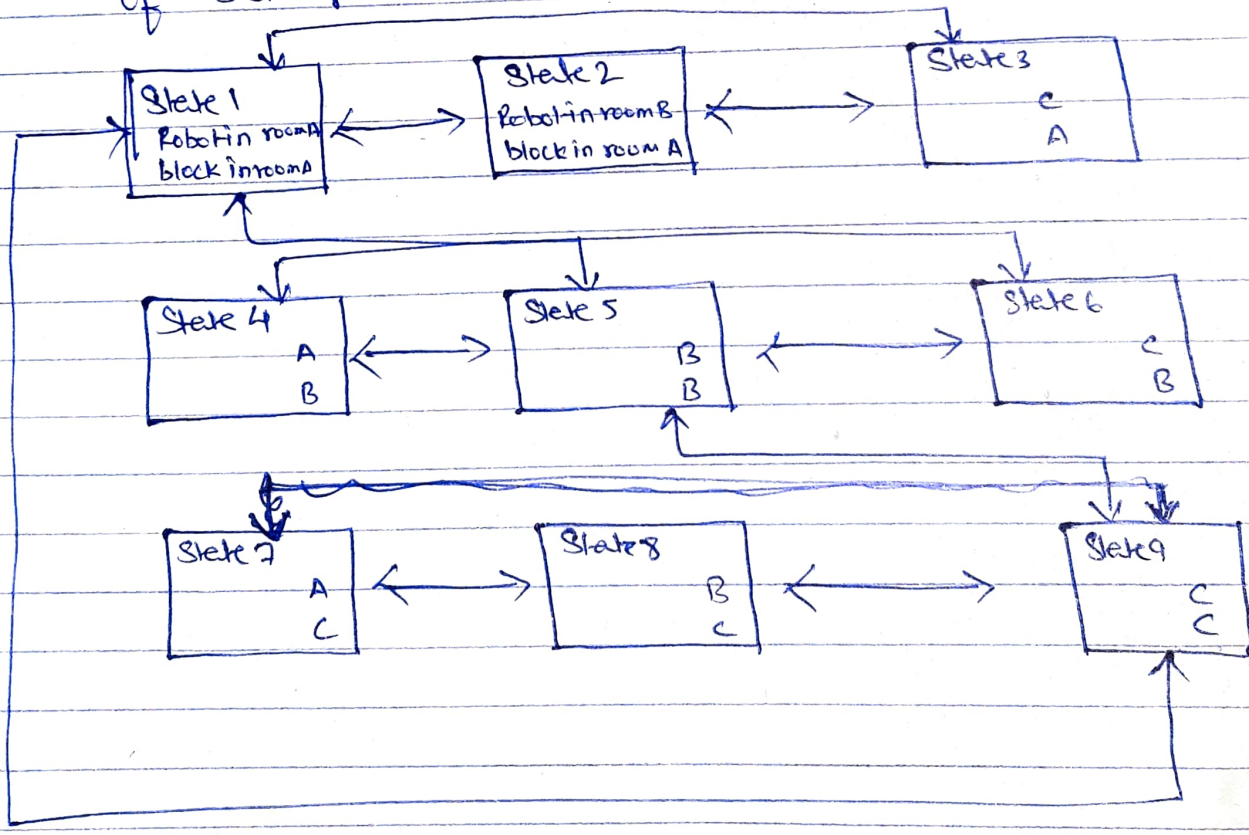


d) Search tree

e) Search Spaces

→. Many problems in AI can be represented as Search Spaces

• In simple terms a Search Space is a representation of set possible choices in a given problem



8) Candidate Elimination

→ The Candidate Elimination ~~is Similar like~~ operates Similar like Simple algorithm

The method operates as follows

- Two Sets are maintained of hypotheses hs and hg
- hs ~~Could~~ initialized as $\{\langle \phi, \phi, \phi, \phi, \phi, \phi \rangle\}$
- hg initialized as $\{\langle ?, ?, ?, ?, ?, ? \rangle\}$

Example	Sky	Air temp	Humidity	wind	Forecast	Enjoy sport
1	Sunny	warm	Normal	Strong	Same	Yes
2	u	u	High	u	u	u
3	Rainy	Cold	u	u	Change	No
4	Sunny	warm	u	u	u	Yes

$\{ S_0 \langle \phi, \phi, \phi, \phi, \phi \rangle$
$\{ g_0 \langle ?, ?, ?, ?, ?, ? \rangle$

Positive $\{ g_1 \langle ?, ?, ?, ?, ?, ? \rangle$
$\{ S_1 \langle$ Sunny, warm, Normal, Strong, ~~warm~~, Same $\rangle$

~~Negative~~ positive $\{ g_2 \langle ?, ?, ?, ?, ?, ? \rangle$
$\{ S_2 \langle$ Sunny, warm, ?, Strong, Same $\rangle$

Negative $\{ S_3 \langle$ u $\rangle$
$G_3 \langle$ Sunny, ?, ?, ?, ? $\rangle \langle$? warm ? ? ? $\rangle \langle$? ? ~~Normal~~ ? ? $\rangle$
$\langle$? ? ? Cool ? $\rangle \langle$? ? ? ? Same $\rangle$

Positive $\{ G_4 \langle$ Sunny ? ? ? ? $\rangle \langle$ ~~Wa~~ ? warm ? ? ? $\rangle$
$S_4 \langle$ Sunny, warm, ?, Strong, ?, ? $\rangle$

10) Bidirectional Associative Memory (BAM)

→ Bidirectional Associative Memory, or BAM is a neural network.

- It was first discussed by Bart Kosko in 1988
- It is similar like Hopfield network.
- The network consists of two layers of nodes where each node in one layer is connected with to every other node in the other layer this means it is fully connected.

11) Hopfield Network

-> • In 1980 John Hopfield invented a recurrent networks that has come to known as a Hopfield Network.

• The activition function used by most Hopfield Network is Sign activition function which is defined as

$$\text{Sign}(x) = \begin{cases} +1 & \text{for } x > 0 \\ -1 & \text{for } x < 0 \end{cases}$$

9) Apply perceptron training process of calculated the binary AND, OR and NOT function on two i/p

AND

$w1 = 1.2$, $w2 = 0.6$, threshold = 1
Learning rate = 0.5

A	B	A : B
0	0	0
0	1	0
1	0	0
1	1	1

1. A = 0, B = 0 and target = 0

- $w_i x_i = 0 * 0 \times 1.2 + 0 \times 0.6 = 0$
- this is not greater than threshold value, o/p = 0

2. A = 0, B = 1 and target = 0
- $w_i x_i = 0 \times 1.2 + 0 \times 0.6 = 0.6$
- this is not greater than threshold value, so the output is 0

3. A = 1, B = 0 and target = 0
- $w_i x_i = 1 \times 1.2 + 0 \times 0.6 = 1.2$

this is greater than threshold value, o/p = 1

So, target value and actual are diff we need to update the weights.

$w_i = w_i + \eta (t - o) x_i$

$w_1 = 1.2 + 0.5(0-1)1 = 0.7$

$w_2 = 0.6 + 0.5(0-1)0 = 0.6$

(1)

$w1 = 0.7$; $w2 = 0.6$; threshold = 1 Learning rate = 0.5

A = 0; B = 0; target = 0

$w_i.x_i = 0 \times 0.7 + 0 \times 0.6 = 0$

this is not greater than threshold value, o/p = 0

(ii)

$w_1 = 0.7$; $w_2 = 0.6$; threshold = 1 learning rate = 0.5

A = 0 ; B = 1 ; target = 0

$w_i \cdot x_i = 0 \times 0.7 + 1 \times 0.6 = 0.6$

this is not greater than threshold value, O/P = 0

(iii) $w_1 = 0.7$; $w_2 = 0.6$; threshold = 1 learning rate = 0.5

A = 1 ; B = 0 ; target = 0

$w_i \cdot x_i = 1 \times 0.7 + 0 \times 0.6 = 0.7$

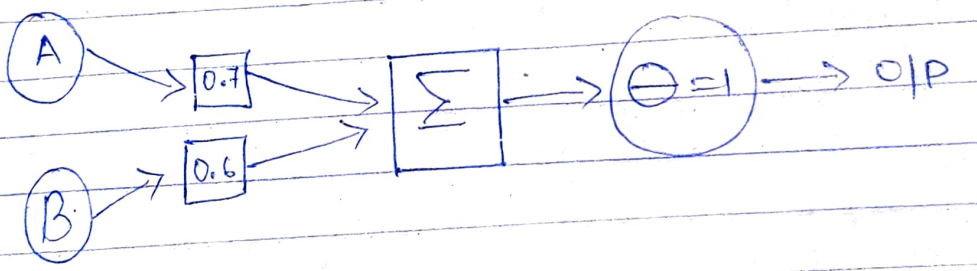
this is not greater than threshold value, O/P = 0

(iv) $w_1 = 0.7$; $w_2 = 0.6$; threshold = 1 , learning rate = 0.5

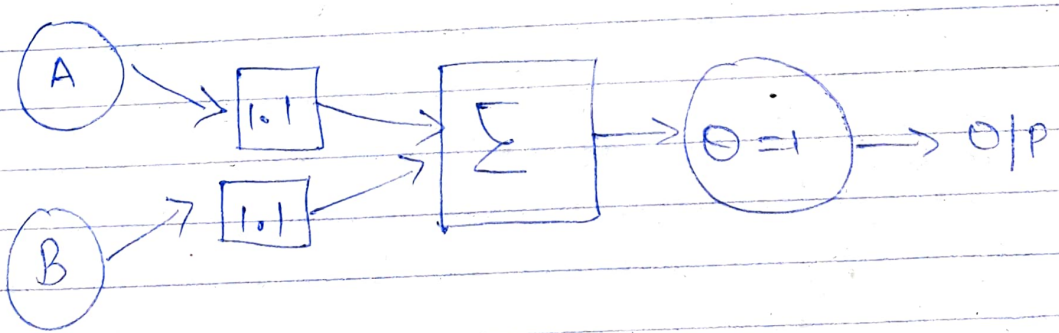
A = 1 ; B = 1 ; target = 1

$w_i \cdot x_i = 1 \times 0.7 + 1 \times 0.6 = 1.3$

this is greater than threshold of 1, so the O/P = 1



OR

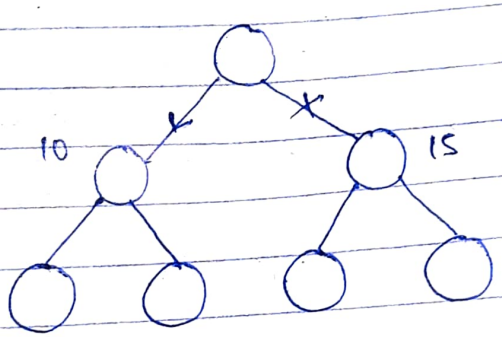


4) → Explain with example how we use heuristics for Search, explain the criteria for Selecting a good heuristic

Heuristics

→ • It is a technique designed to solve a problem quickly.

• In choosing heuristics, we usually consider that a heuristics that reduces the number of nodes that needed to examined in the Search tree is good heuristics



5) Explain diff technique to identify optical paths.

→ The optimal path ~~through a Search~~ is the one that has the lowest cost or involves traving the Shortest distance from Start to the end node

• The Simplest forum the identify the optimal path is called British ~~new~~ museum procedure.

• This involves examing every Single path and returning from the best path.

7) General to Specific ordering

→ $h_g = \langle ?, ?, ?, ?, ? \rangle$

$h_s = \langle \phi, \phi, \phi, \phi, \phi \rangle$

h_g is the most general hypothesis
h_s is the most specific hypothesis

example	Citation	Size	inLibrary	Price	edition	buy
1	Some	Small	no	affordable	many	no
2	many	big	no	expensive	one	yes
3	Some	big	always	u	few	no
4	many	Medium	no	u	many	yes
5	many	Small	no	affordable	many	yes

$h_0 = \langle \phi, \phi, \phi, \phi, \phi \rangle$

$x_1 = x$

$h_1 = \langle \phi, \phi, \phi, \phi, \phi \rangle$

$x_2 = \langle$ many, big, always, expensive, one $\rangle$

$h_3 = \langle$ many, many, big, no, expensive, One $\rangle$

$x_3 = x$ NO

$h_4 = h_3 \langle \quad u \quad \rangle$

$x_4 = \langle$ many, medium, no, expensive, many $\rangle$

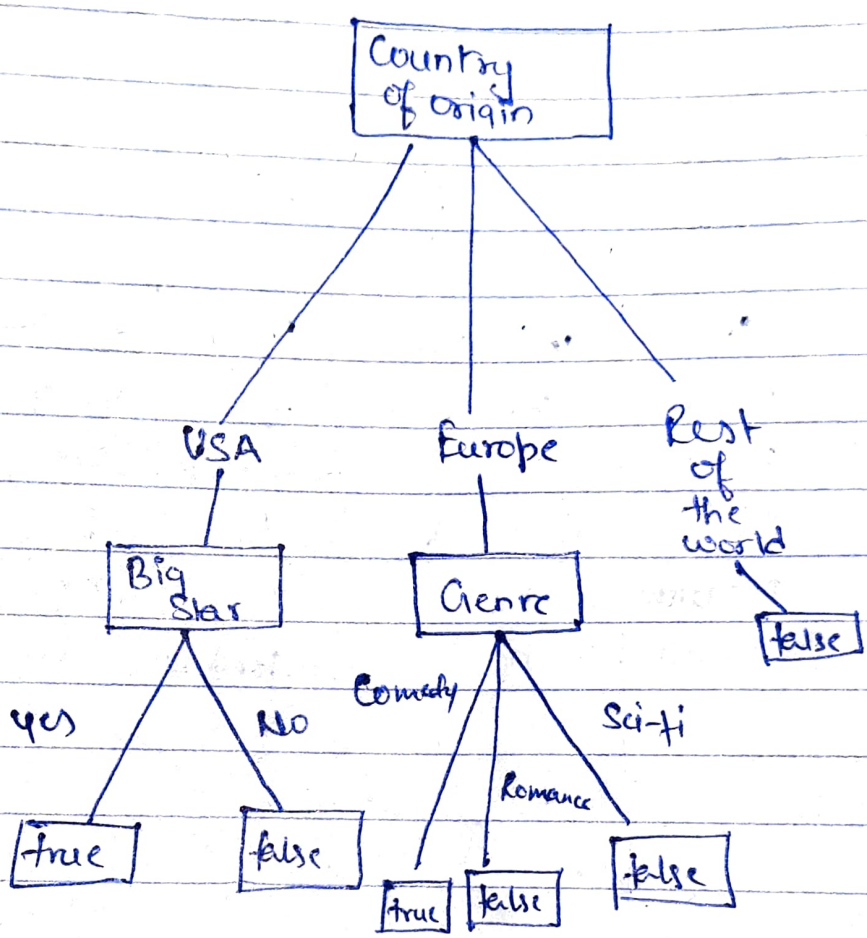
$h_4 = \langle$ many, ?, no, expensive, ? $\rangle$

$x_5 = \langle$ many, Small, no, affordable, many $\rangle$

$h_5 = \langle$ many, ?, no, ?, ? $\rangle$

12) Decision tree

→ • It is a variety of the tree where leaf nodes are the boolean values is called decision tree.



Problem:-

13) Goal tree

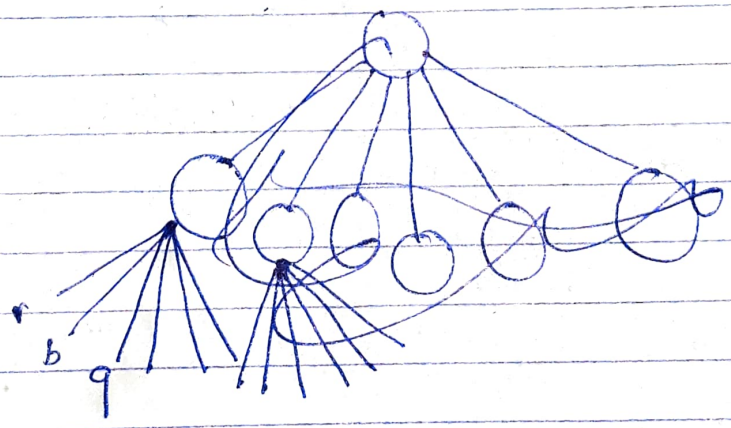
→ • Goal tree is a form of Semantic tree.
• It is used to represent a problem which is broken into a form of a tree

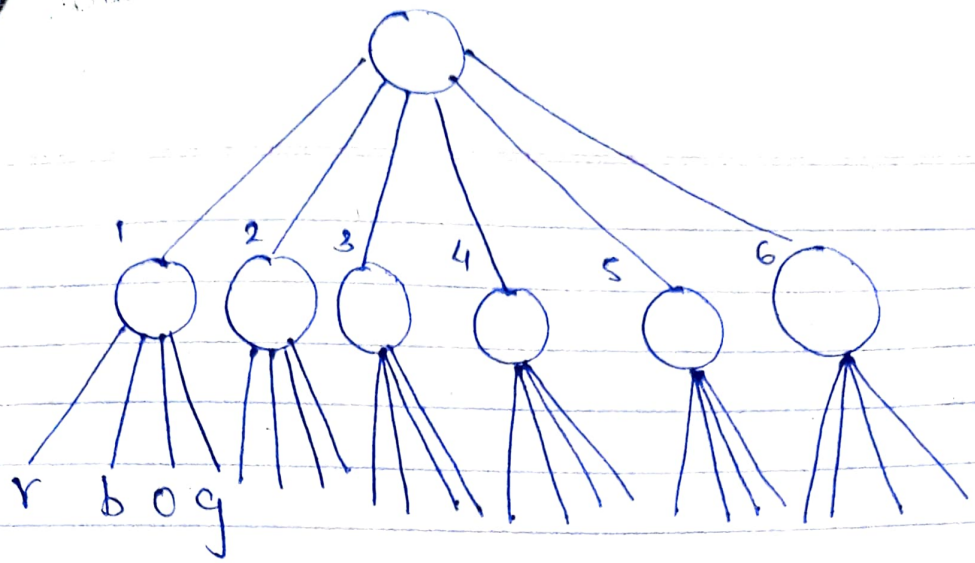
• We can say the Solution is the goal tree. each steps is the sub-goal.
• goal tree is drawn same as other Semantic tree and Search tree.

• It is so useful because it reduces the problem into Subgoal

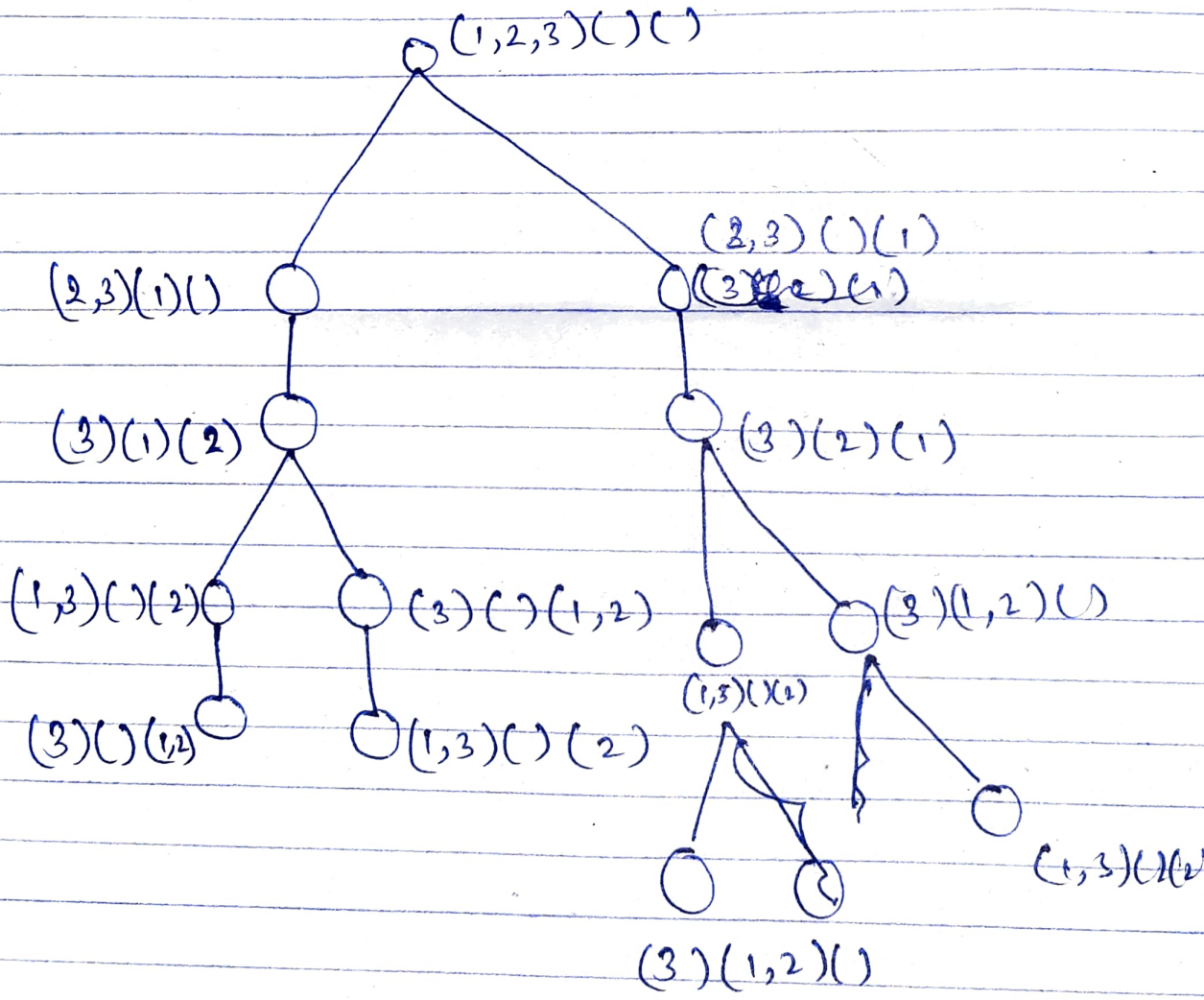
• for example:
if you want to cook dinner for your parents the goal is to cook dinner but before cook we need some sub goals like.
• find recipe
• go to Supermarket
• buy ingredients
• cook dinner

14) Map Colouring problem





b)



15) Constraint Satisfaction Problem

→ Search can be ~~Solve~~ used to solve problem that are limited by constraint, such as 8-queen problem Such problem are often known as constraint satisfaction problem.

- In this problem no- two queen should be placed in same row or column.