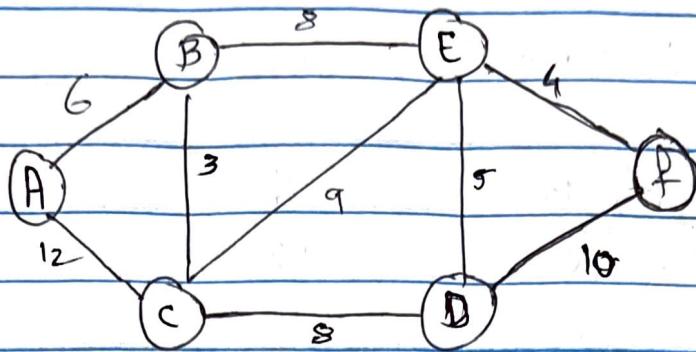


Assignment - 1

Name : Jayesh Parmanani
ID : 1001964955



Q) Uniform Cost Search. (cheapest node first)

Cost

$$A \rightarrow B : 6 \quad E \rightarrow F : 4$$

$$A \rightarrow C : 12 \quad E \rightarrow C : 9$$

$$B \rightarrow E : 8 \quad C \rightarrow B : 3$$

$$B \rightarrow C : 3 \quad C \rightarrow D : 8$$

$$B \rightarrow A : 6 \quad C \rightarrow E : 9$$

~~$$B \rightarrow F : 10 \quad F \rightarrow E : 4$$~~

$$E \rightarrow D : 5 \quad F \rightarrow D : 10$$

$$D \rightarrow C : 8$$

$$D \rightarrow E : 5$$

$$D \rightarrow F : 10$$

~~closed~~: ~~closed~~ B

Fringe: A B E D F
 00 16 214 317 318

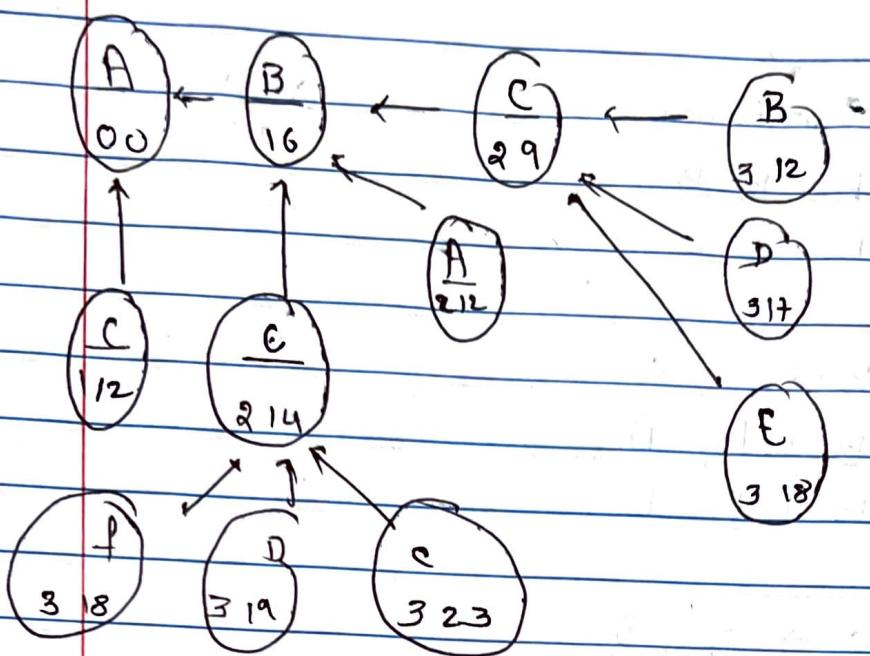
Closed set: {A, B, C, E, D}

Goal \rightarrow F cost \Rightarrow 18

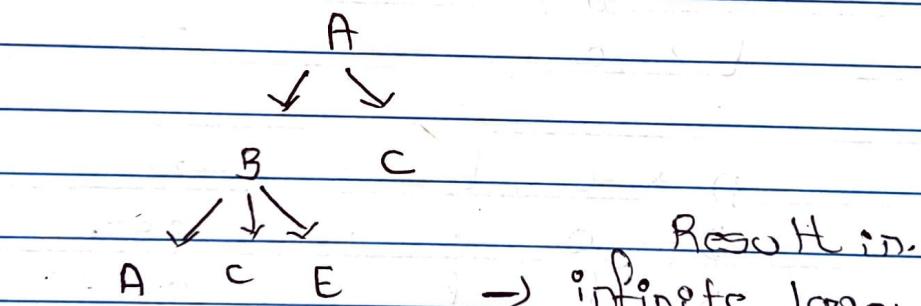
Path A \rightarrow B B \rightarrow F E \rightarrow F

Explanation:

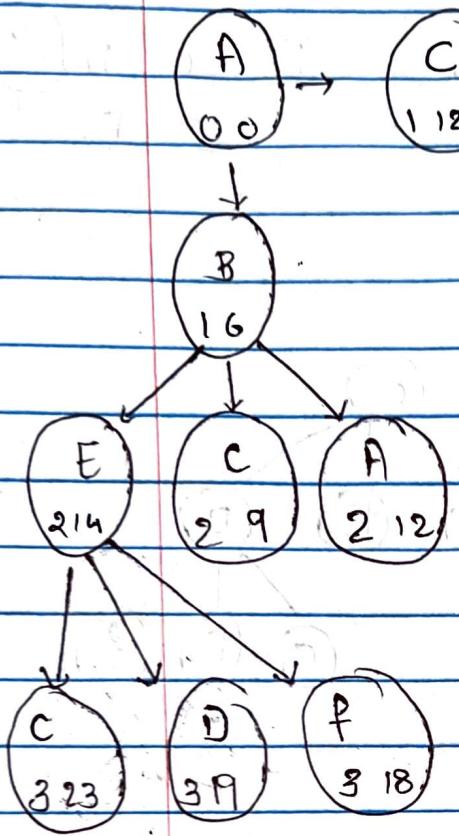
SuccFunc	COST
$A \rightarrow B, B$	6
$A \rightarrow C, C$	12
$B \rightarrow C, C$	9
$B \rightarrow A, A$	12
$B \rightarrow E, E$	14
$C \rightarrow B, B$	12
$C \rightarrow D, D$	17
$C \rightarrow E, E$	18
$E \rightarrow F, F$	18
$E \rightarrow D, D$	19
$E \rightarrow C, C$	23
$D \rightarrow E, E$	22
$D \rightarrow C, C$	25
$D \rightarrow F, F$	27
$F \rightarrow \underline{\text{Goal}}$	



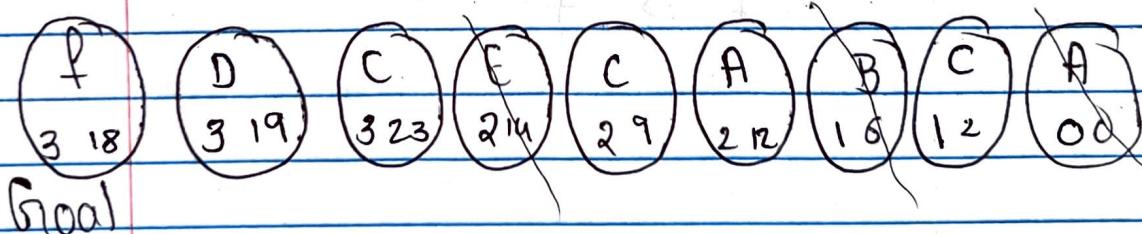
2) DFS : can result in infinite loop.



Best solution : One of solution.



fringe :

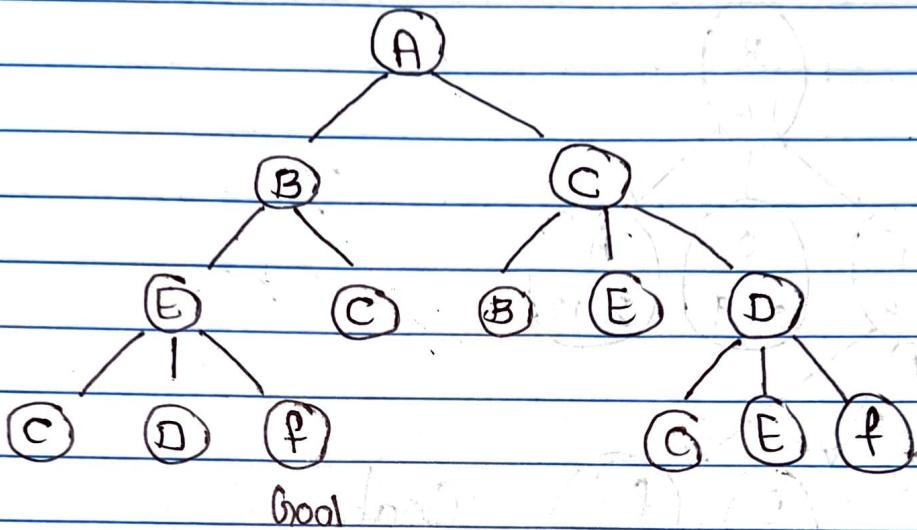


3)

BFS: Goal

Fringe:

A B C E C B E D C D
C E f



Path :

A → B

B → E

E → f

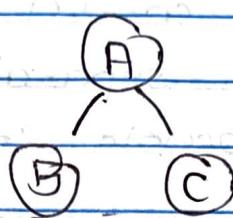
4) TDS :

limit = 0



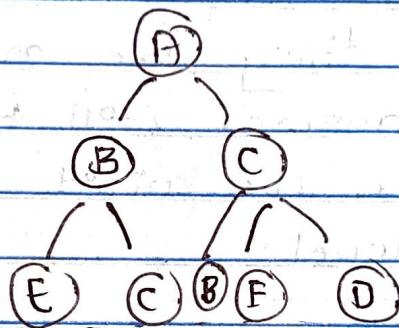
No goal

limit = 1



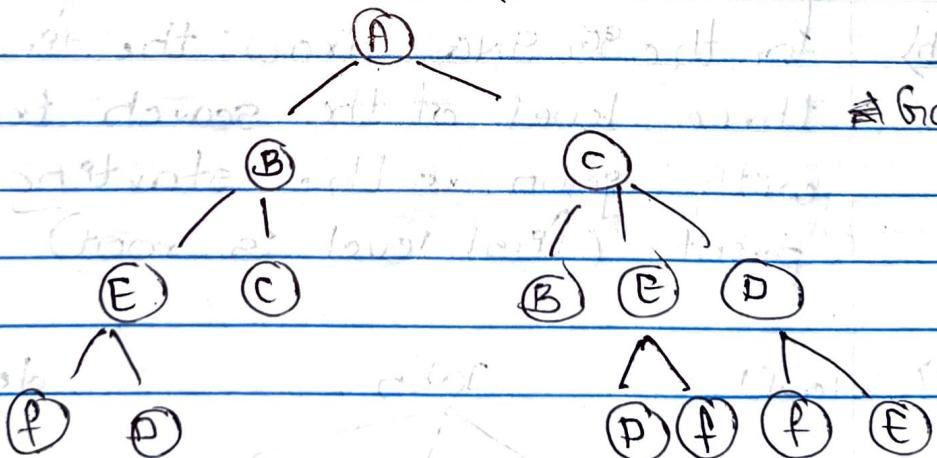
No goal

limit = 2



No goal

limit = 3



Goal

=

Goal : A → C → ~~B~~ → D → F

(a)

Task 2

- c) from among the general tree graph search using bfs, dfs, IDS & UCS, which one guarantee finding the correct number of degrees of separation between any two people in the graph?

→ Degree of Separation mean how closely they are connected.

∴ The answer will be BFS because we visit node at every level.

b)

for the ~~SNC~~ SNG, draw the first three level of the search tree with john as the starting point. (first level is root)

→

level 1

John

degree 0

level 2

George

Helen

Christine

degree 1

level 3
mary

John

John

John

Mary

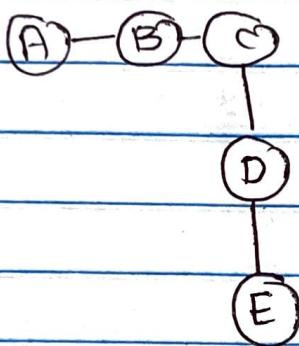
degree 2

i) >

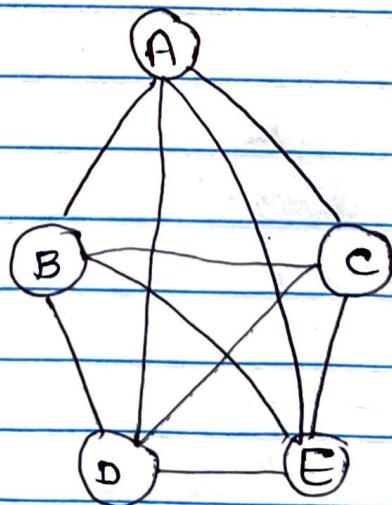
⇒ No; because John in the SNG corresponds to multiple nodes in the search tree.

vii) >

→



viii) >



vii)

For getting the required memory usage, we need to ensure 1-1 corresponds between nodes & vertices.

Change graph search with Bfs.



Q) from A to D we can get
43 values

$$h(x) \leq h^*(x).$$

$$A \rightarrow E \rightarrow C \rightarrow D = 37$$

$$A \rightarrow B \rightarrow f \rightarrow C \rightarrow D = 27$$

$$A \rightarrow B \rightarrow C \rightarrow D = 30$$

from B to D,

$$B \rightarrow f \rightarrow C \rightarrow D = 17$$

$$B \rightarrow C \rightarrow D = 20$$

from C to D

$$C \rightarrow D = 5$$

from f to D

$$f \rightarrow C \rightarrow D = 9$$

from E to D;

$$E \rightarrow C \rightarrow D = 25.$$

Heuristic 1) Admissible with some

$$h(A) = 5$$

modifications.

$$h(B) = 20$$

(should be less than 17)

$$h(C) = 15$$

(should be less than 5)

$$h(f) = 0$$

$$h(D) = 0$$

$$h(E) = 10$$

Heuristic 2> with modifications

$$h(A) = 40 \quad (\leq 27)$$

$$h(B) = 40 \quad (\leq 17)$$

$$h(C) = 40 \quad (\leq 25)$$

$$h(D) = 40 \quad (\textcircled{2})$$

$$h(E) = 40 \quad (\leq 25)$$

$$h(F) = 40 \quad (\leq 9)$$

Heuristic 3>

$$h(A) = 10 \quad \text{Admissible.}$$

$$h(B) = 15$$

$$h(C) = 0$$

$$h(D) = 0$$

$$h(E) = 25$$

$$h(F) = 5$$

Heuristic 4>

Admissible, but heuristic
can be better.

Task 4.

→ Goal = Black.

Given,

Red → green/blue children

Blue → Red/black

Green → blue/yellow

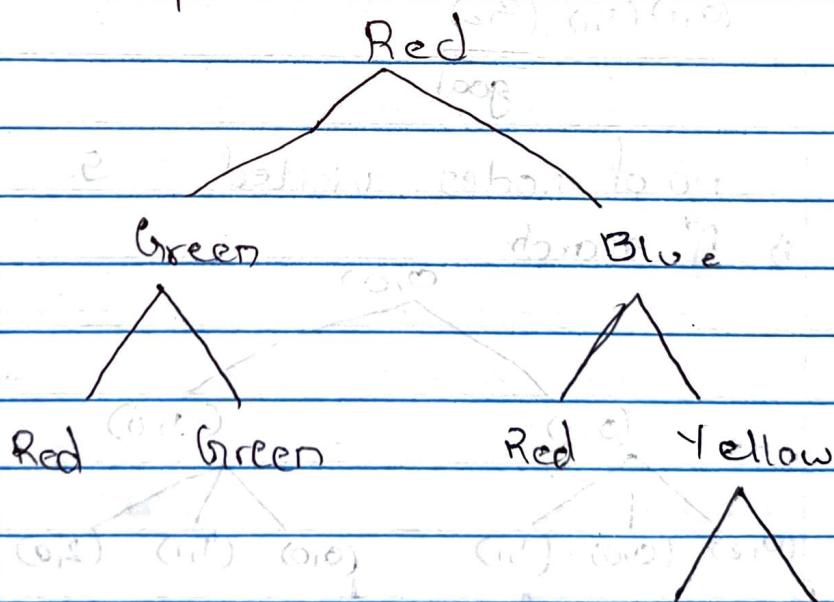
Yellow → yellow/red

Black → green/black

As black is goal node,

$$h(\text{black}) = 0$$

Graph



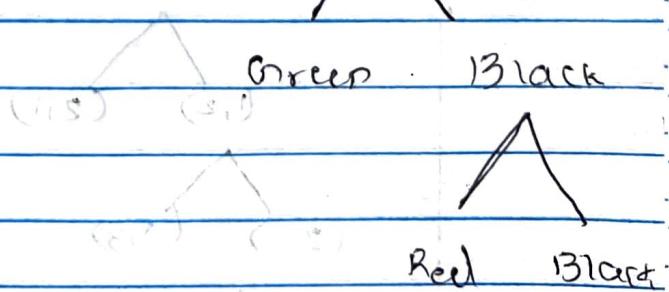
$$\therefore h(\text{Red}) = 3$$

$$h(\text{Blue}) = 2$$

$$h(\text{green}) = 4$$

$$h(\text{yellow}) = 1$$

$$h(\text{black}) = 0$$



Task 5

→ Case 1.

for fig 5;

Greedy search always performs better or same as A*

i) Greedy search:

start 0,0 end 2,2

(0,0)

(0,1) (1,0)

(0,2) (0,1) (1,1)

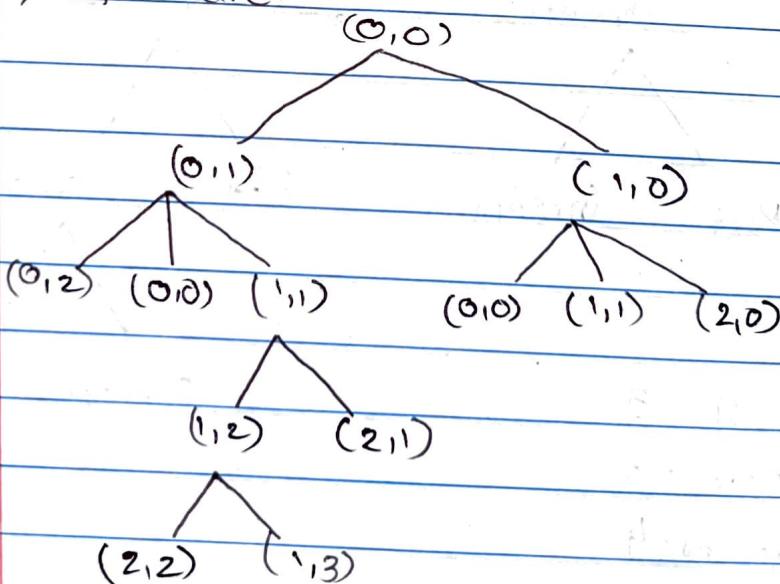
(1,2) (2,1) (1,0) (0,1)

(0,2) (1,1) (2,2)

goal

No of nodes visited = 5

ii) A* search:



No of nodes visited = 8

(0,0) → (0,1) → (1,1) → (1,0) → (1,1) → (0,2) → (1,2) → (2,2)

case 2)

Greedy performing better, sometimes worse
sometimes same as f*

Eg start = 0, 2

end = 2, 4

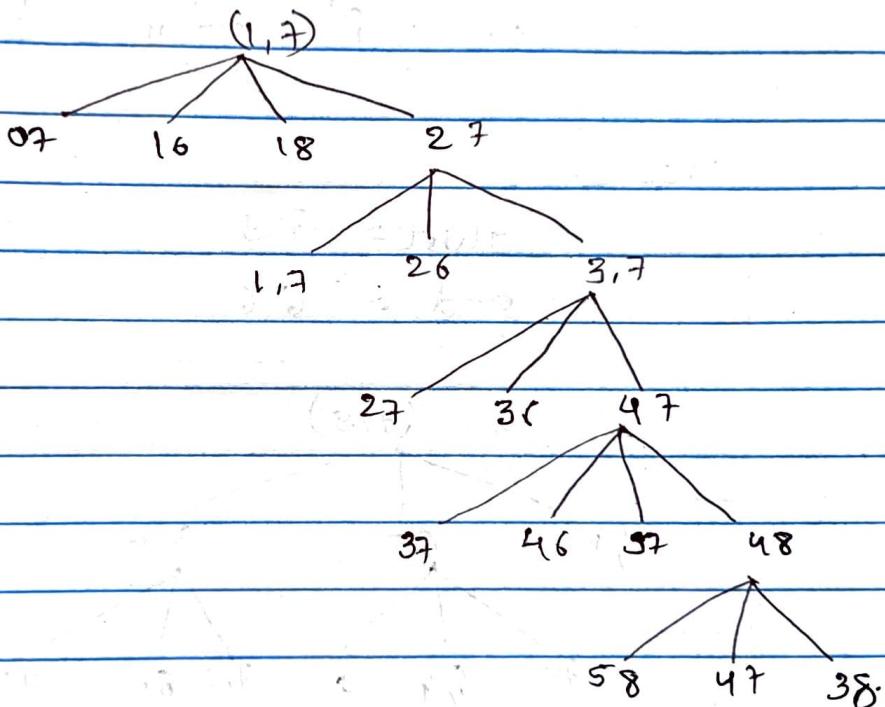
Hence

for this greedy performs better.

case 3)

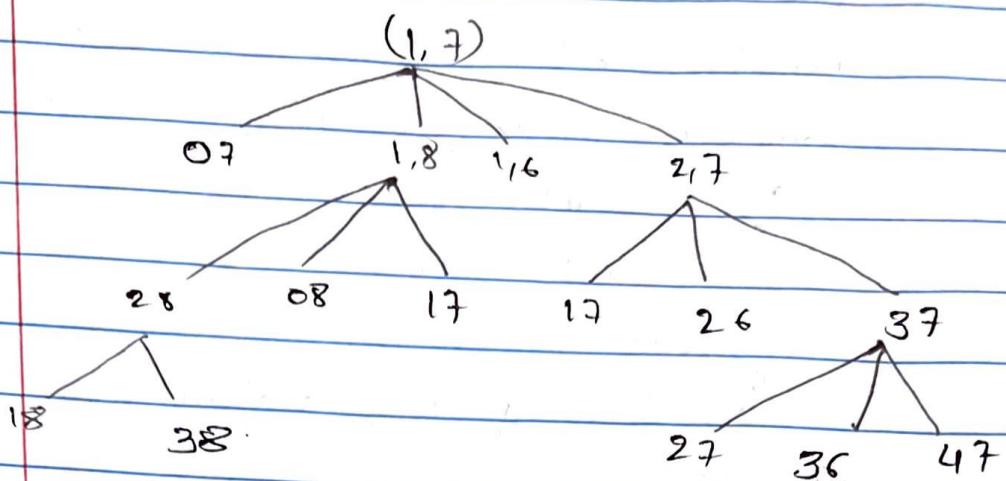
More greedy (performs better)
greedy :

start = 1, 7 end = 3, 8.



Visited = 8

A*



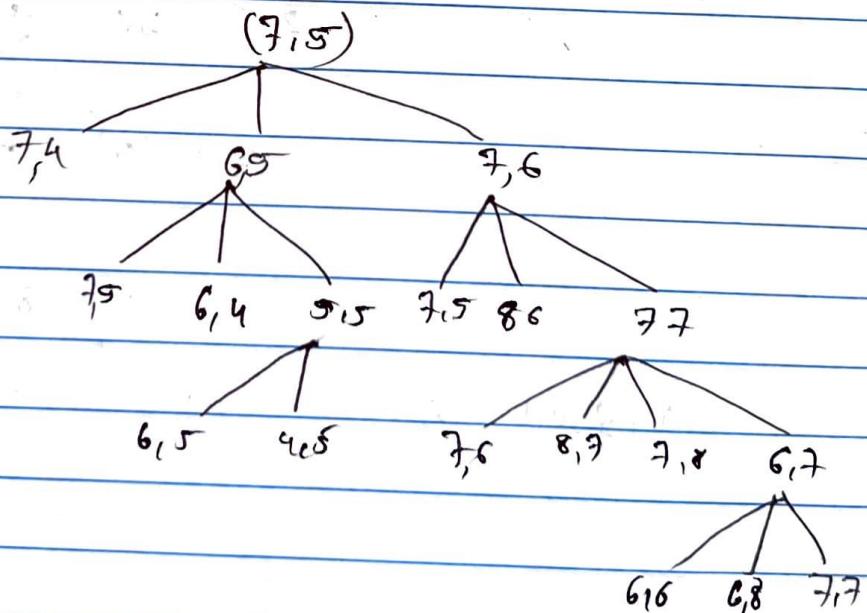
$$\text{visited} = 6$$

Here A* performs better.

case 3)

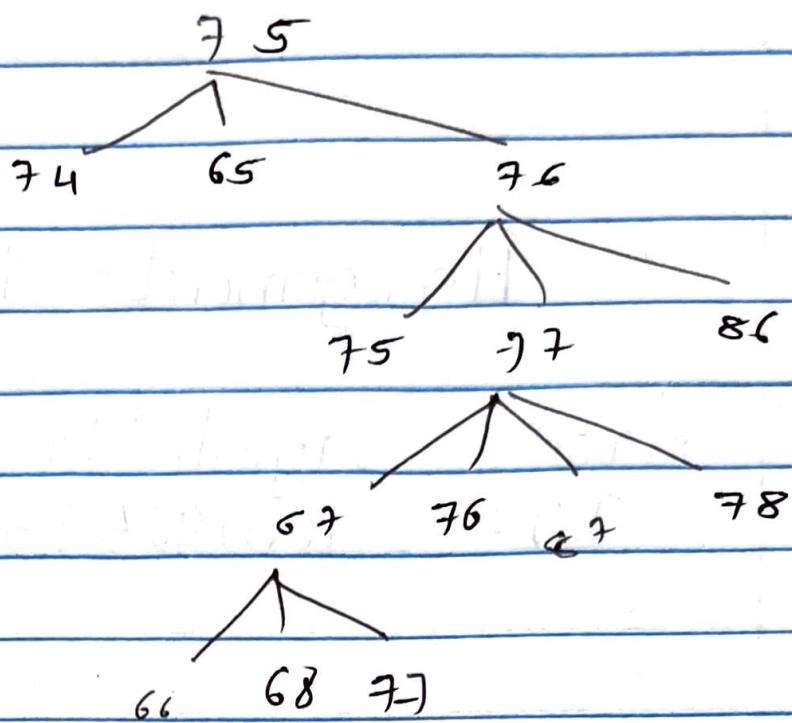
$$\text{start} = 7, 5$$

$$\text{end} = 6, 6$$



$$\underline{\text{visited}} = 7$$

A^*



visited = 7

Here f^* performs equal with greedy