* problem solving agent: is a goal based agent. It decide what to do by finding different problem sequence of actions that lead to the desirable states and then choosing the best sequence.

* Search Algorithm: takes a problem as input and return a solution in the form of an action sequence.

* Reflex agent: choose action based on current percept. Do not consider the future consequences of their actions. Consider how the world is.

* Planning agent: Ask "what if". Decision based on consequences of actions. Must formulate a goal. Consider how the world would be.

* Properties of Search Algorithm: Four essential properties:

i. Completeness: A search algorith is said to be complete if it guarantees to return a solution.

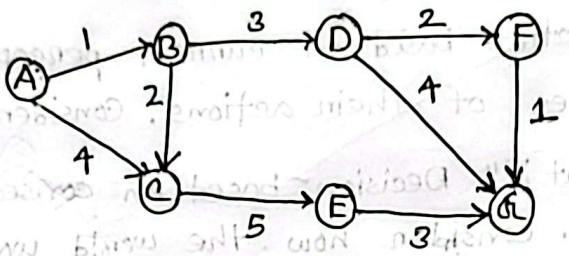
ii. Optimality: If a found solution is guaranteed to be the best solution among all solution, then such solution is said to be an optimal solution.

iii. Time complexity: measure of the time for completing its task.

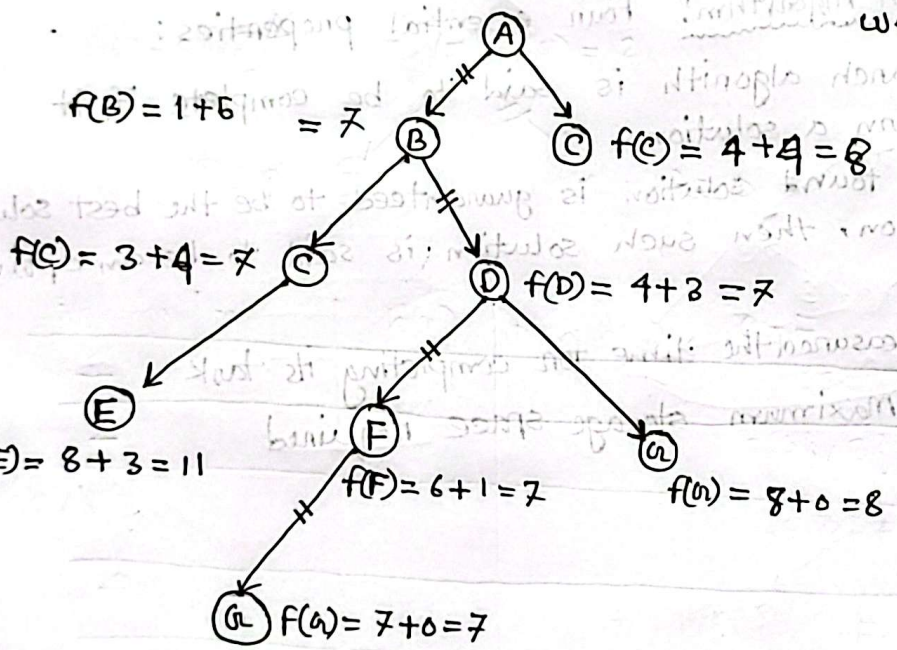
iv. Space complexity: maximum storage space required

* ~~Hur~~ Heuristics Function : is a function used in "Informed search". It finds the most promising path. A hurestic is a function that estimates how close a state is to a goal. Designed for a particular search problem. Ex: Manhattan, Euclidean Distance.

Q. A* Search Algorithm:



n	h(n)
A	5
B	6
C	4
D	3
E	3
F	1
G	0



we know,

$f(n) = g(n) + h(n)$

[B < E]

[E, D < 8]

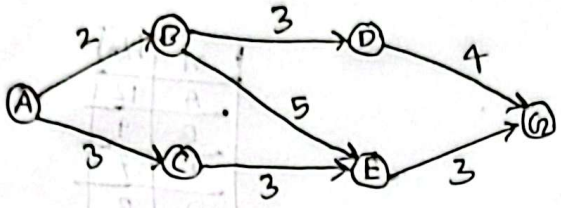
[E < E, C]

∴ path = A → B → D → F → G

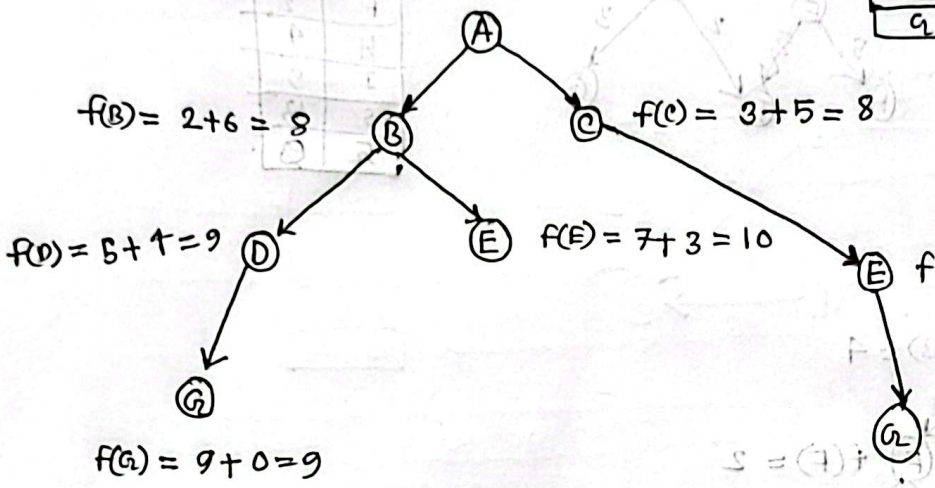
cost = 7

Iteration	path	g(n)	h(n)	f(n) = g(n)+h(n)	C-F	O-F
initially	A	0	5	5	-	-
iteration-1	A → B A → C	1 4	6 4	7 8	{A}	{B, C}
iteration-2	A → B → C A → C	3 4	4 4	7 8	{A, B}	{C(8), C(7),}

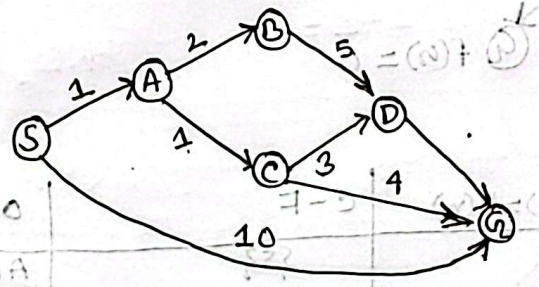
Q.



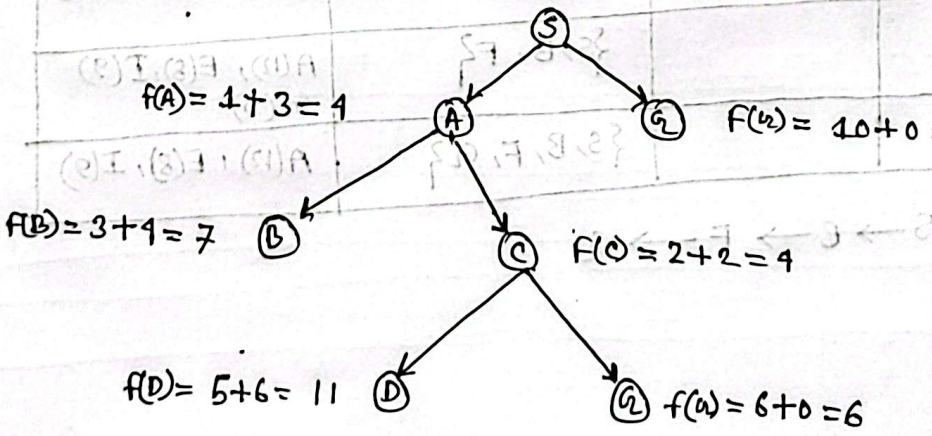
n	h(n)
A	6
B	6
C	5
D	4
E	3
G	0



Q.



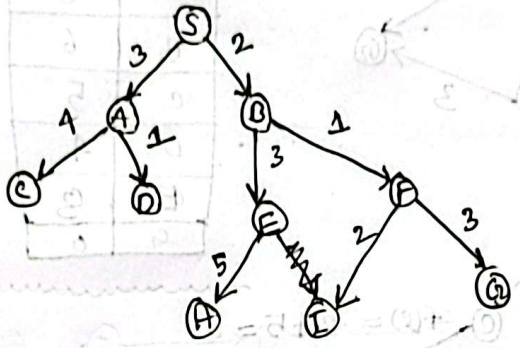
n	h(n)
S	5
A	3
B	4
C	2
D	6
G	0



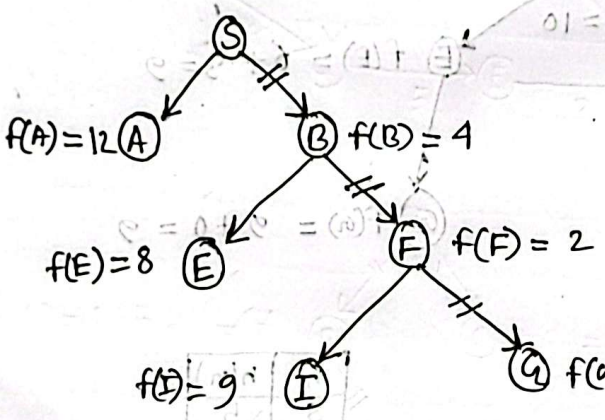
∴ path = S → A → C → G

cost = 6

Q: Greedy Best first Search:



n	h(n)
A	12
B	4
C	7
D	3
E	8
F	2
H	4
I	9
S	13
G	0



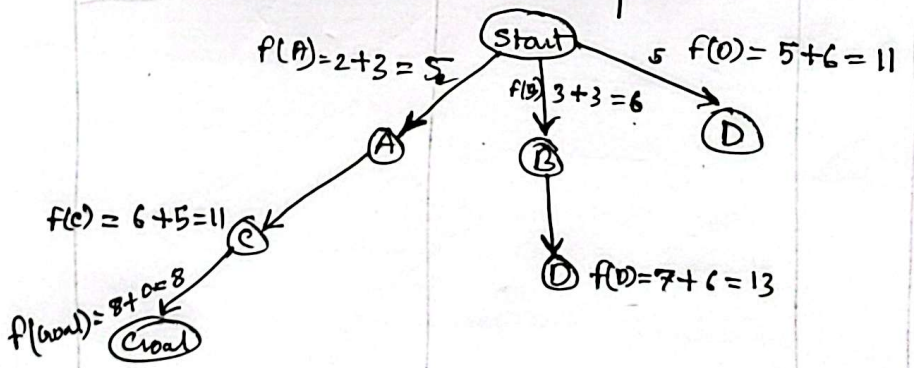
Iteration	n	h(n)	f(n)=h(n)	C-F	O-F
1				{S}	A(12), B(4)
2				{S, B}	A(12), E(8), F(2)
3				{S, B, F}	A(12), E(8), I(9) G(0)
4				{S, B, F, G}	A(12), E(8), I(9)

∴ path = S → B → F → G

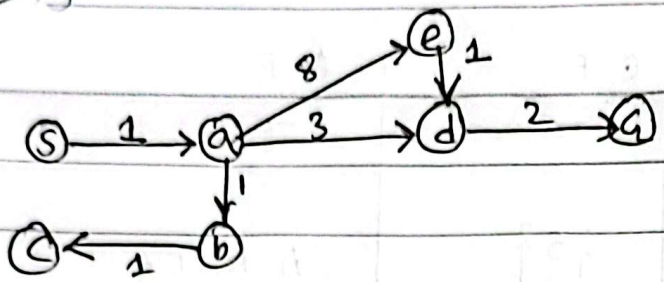
(b) :

n	h(n)
Start	3
A	3
B	3
C	5
D	6
Goal	0

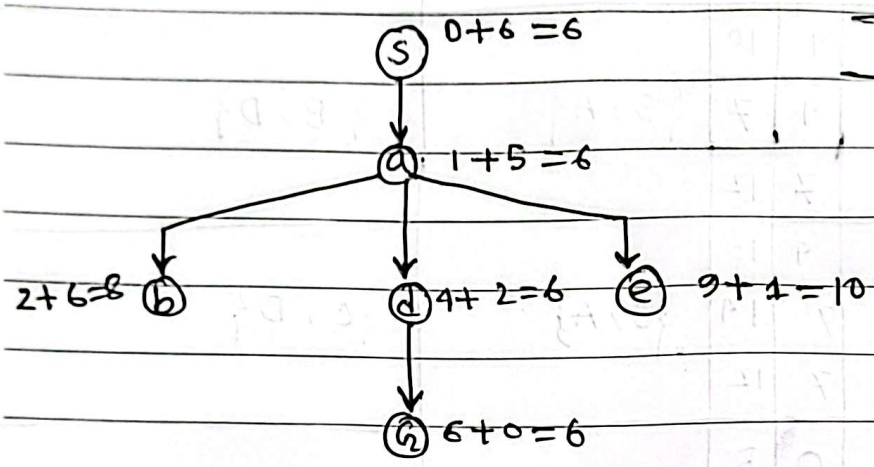
Iteration	Path	g(n)	h(n)	f(n)	C-F	O-F
Initially	Start	0	3	3	—	—
I-1	Start → A	2	3	5	{S}	{A, B, D}
	Start → B	3	3	6		
	Start → D	5	6	11		
I-2	Start → A → C	6	5	11	{S, A}	{C, B, D}
	Start → B	3	3	6		
	Start → D	5	6	11		
I-3	Start → A → C	6	5	11	{S, A}	{C, B, D}
	Start → B → D	7	6	13		
	Start → D	5	6	11		
I-4	Start → A → C → Goal	8	0	8	{S, A, C}	{B, D}
	Start → D	5	6	11		



Date



S	6
a	5
b	6
c	7
d	2
e	1
G	0



iteration	path	g(n)	h(n)	f(n)	C-F	O-F
initially	S	0	6	6	—	—
I-1	S → a	1	5	6	{S}	{a}
I2	S → a → b	2	6	8	{S, A}	{b, d, e}
	S → a → d	4	2	6		
	S → a → e	9	1	10		
I3	S → a → d → G	6	0	6	{S, A, d}	{b, e}
	S → a → b	2	6	8		
	S → → a → e	9	1	10		

∴ Path = S → a → d → G

Cost = 6

Date

admisibility:

$0 \leq h(n) \leq h^*(n)$

$s = 0 \leq 6 \leq 6$

$a = 0 \leq 5 \leq 5$

$b = 0 \leq 6 \leq \infty$

$d = 0 \leq 2 \leq 2$

$e = 0 \leq 1 \leq \infty$

Consistency:

$h(A) - h(C) \leq cost(A, C)$

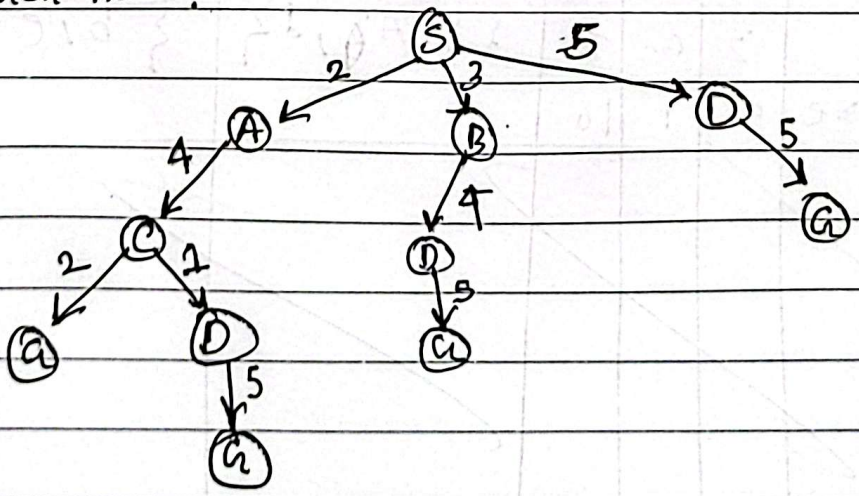
$h(S) - h(a) \Rightarrow 5 - 6 = 1 \leq 1$

Date

iteration	path	g(n)	h(n)	f(n)	C-F	O-F
initilize	{S}	0	3	3	—	—
I-1	S→A	4	2	6		
	S→B	3	4	7	{S}	{A, B, D}
	S→D	5	7	12		
	S→A→C	6	4	10		
I-2	S→B	3	4	7	{S, A}	{B, D}
	S→D	5	7	12		
	S→A→C	6	4	10		
I-3	S→B→D	7	7	14	{S, A}	{C, D}
	S→D	5	7	12		
	S→A→C→G	8	0	8		
I-4	S→A→C→D	7	7	14	{S, A, C}	{G, D}
	S→B→D	7	7	14		
	S→D	5	7	12		

∴ path = S→A→C→G & cost = 8

Search tree :



$h(s) = 2+1 = 3$

$h(A) = 0+2 = 2$

$h(B) = 2+2 = 4$

$h(C) = 2+2 = 4$

$h(D) = 4+3 = 7$

$h(G) = 0$

n	h(n)
S	3
A	2
B	4
C	4
D	7
G	0