Assignment 1A

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Class : BE-IT

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subject: JS Lab

DOP	DOA	Marks	Sign

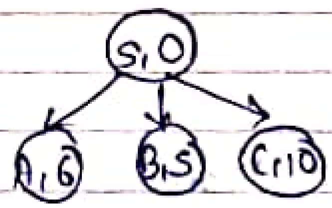
Assignment - 1(a)

Q.1. Consider following defination of state space for some arbitiary problem. The number mentioned against the edges is cost to be incurred in moving from one node to other in any direction. The number is red font mentioned against the node is heuristic function value.

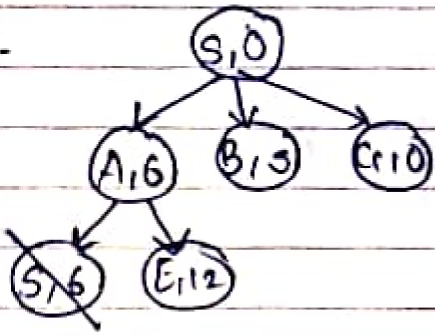
Q1.1. Apply BFS on above graph

Step 0:-

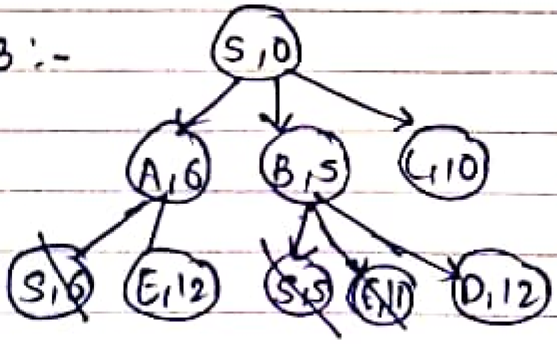
Step 1:-



Step 2:-

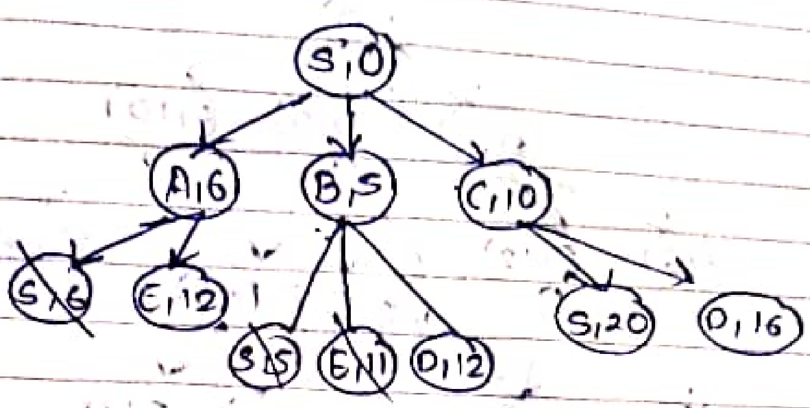


Step3:-

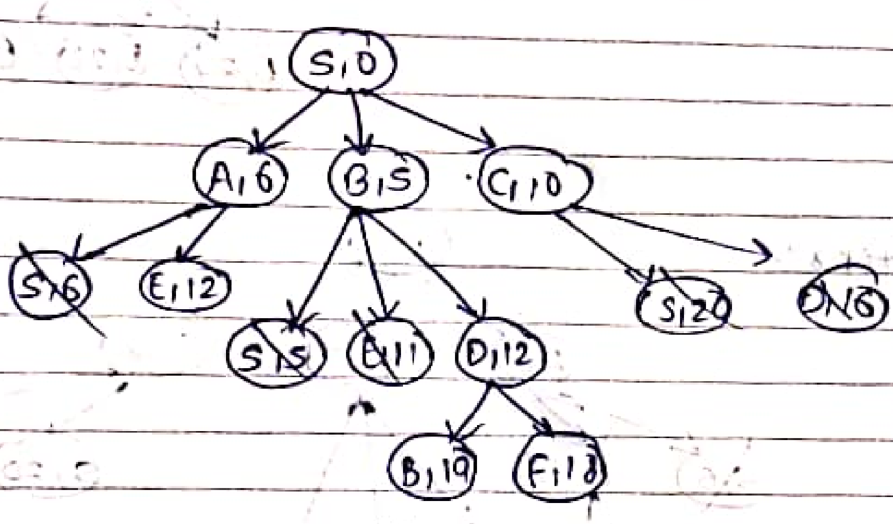


~~Step4:-~~

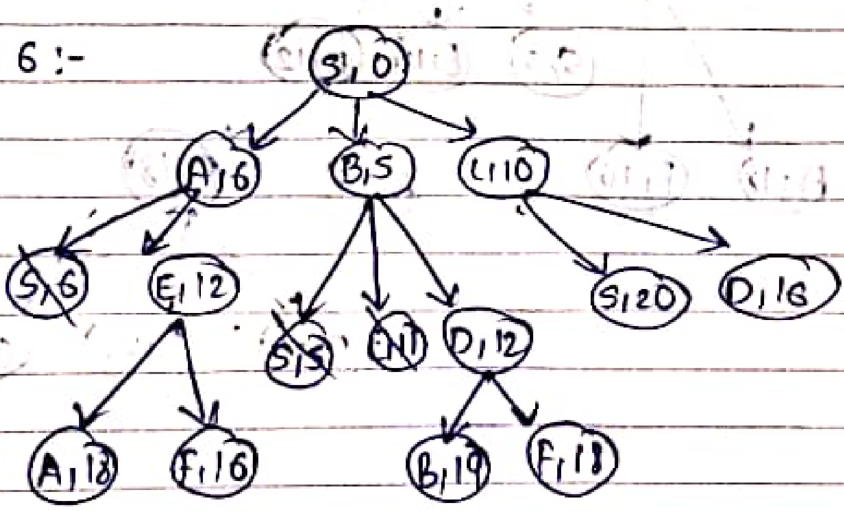
Step 4 :-



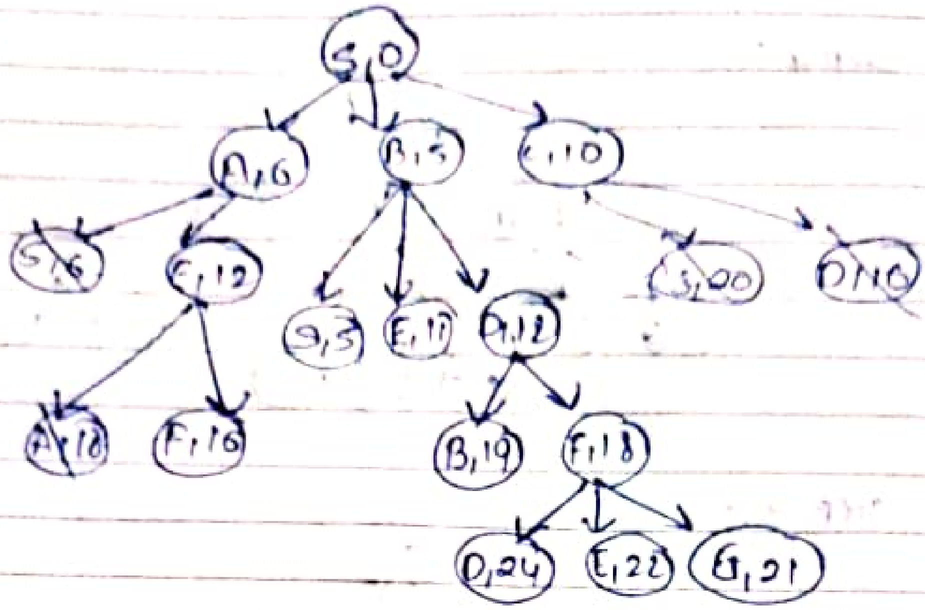
Step 5 :-



Step 6 :-

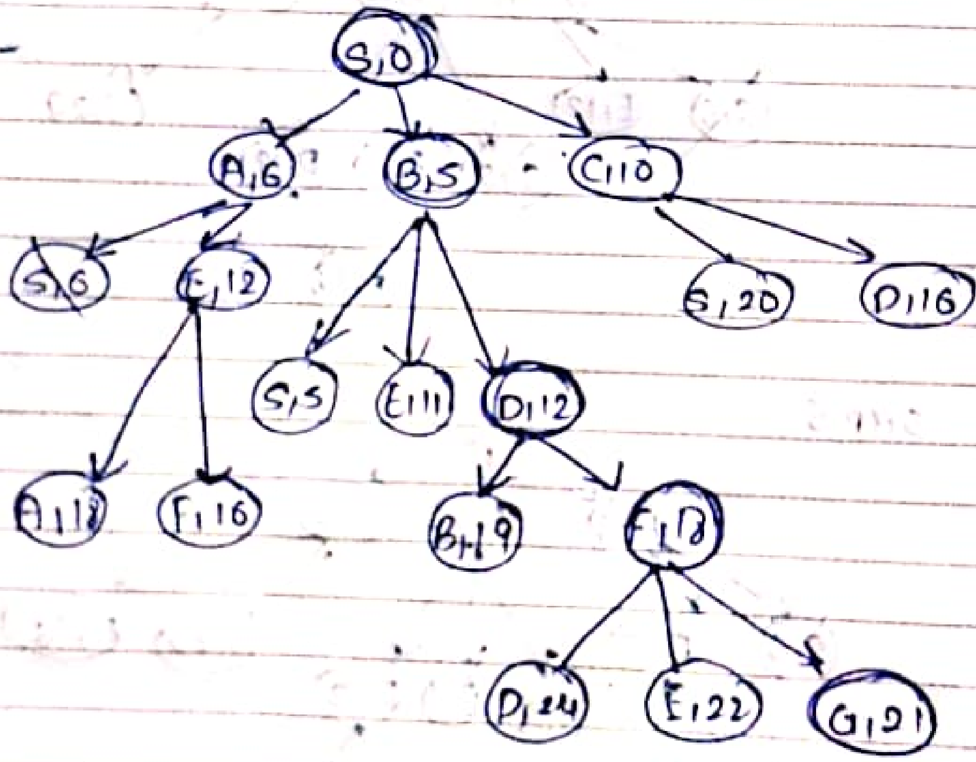


Step 7 :-



S,0
A,6
B,5
C,10
S,6
E,12
S,5
E,11
D,12
S,20
D,16
A,18
F,16
B,19
F,18
D,24
E,22
G,21

Step 8 :-



S,0
A,6
B,5
C,10
S,6
E,12
S,20
D,16
S,5
E,11
D,12
A,18
F,16
B,19
F,18
D,24
E,22
G,21

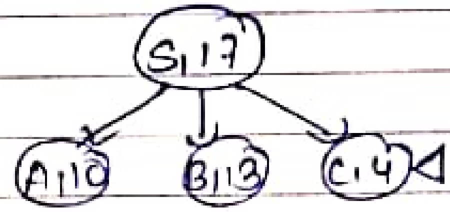
Q 1.4. Apply Best First Search and Clearly show all the steps using search tree.

- Initialization : Compute the f-score for S and put it in the Openlist.

F-score S : f(S) = h(S) = 17 (S, 17)

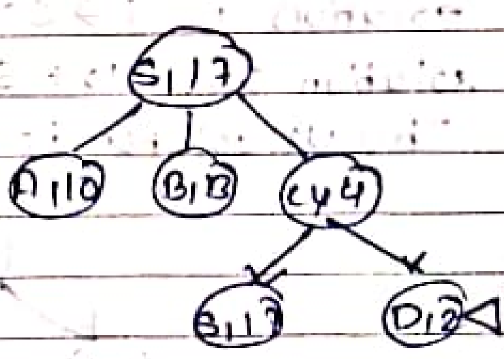
Step 1 :- F-score of successors

F(A) = h(A) = 10
F(B) = h(B) = 13
F(C) = h(C) = 4



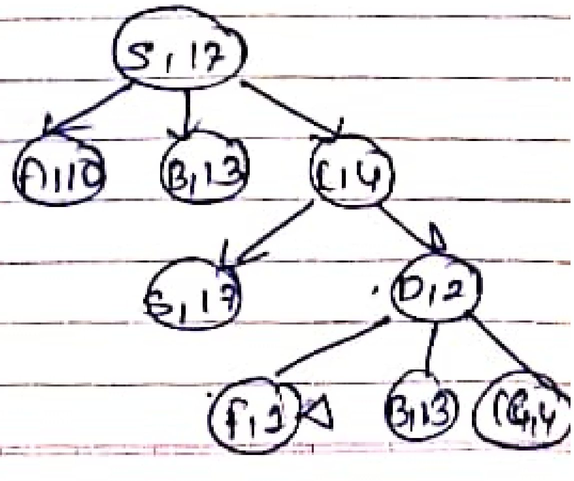
Step2 :- F-score of successors

f(S) = h(S) = 17
F(D) = h(D) = 2



Step3 :- f-score of successors

F(C) = h(C) = 4
F(B) = h(B) = 13
F(F) = h(F) = 1

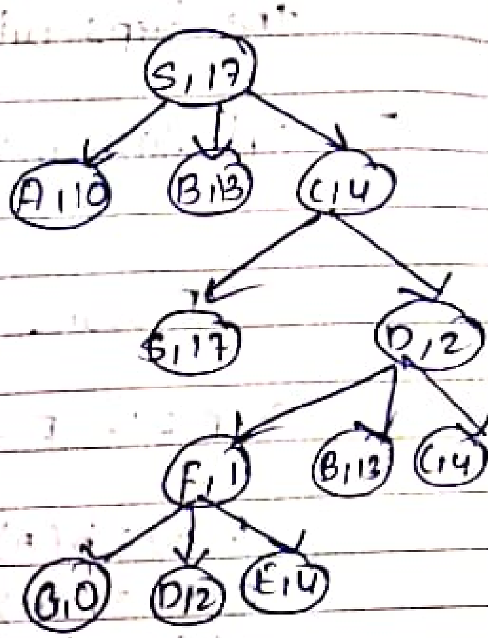


Step 4 :- f. score of Successor

$f(D) = h(D) = 2$

$f(E) = h(E) = 4$

$f(G) = h(G) = 0$

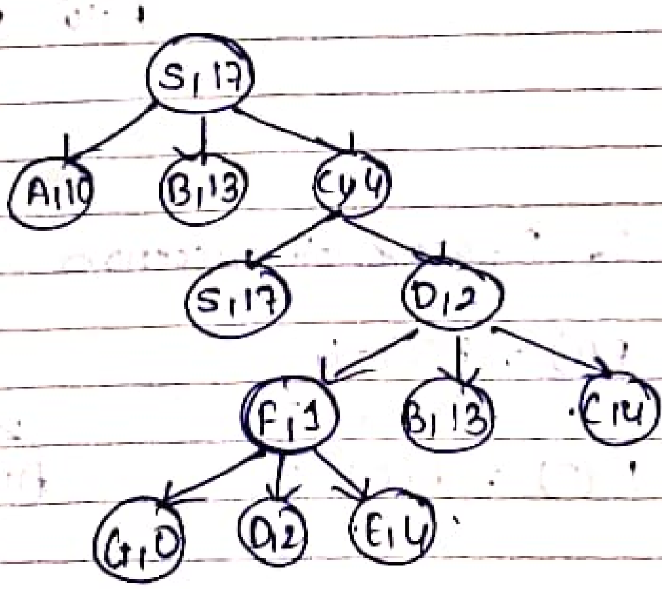


Step 5 :-

solution is $S \rightarrow C \rightarrow D \rightarrow F \rightarrow G$ with

solution cost $= 10 + 6 + 6 + 3 = 25$

This solution is an optimal solution



Q.2.

a. The lowest path cost g(n) can be the cost to reach the goal configuration in least steps.
In our case, we can reach the final configuration in of least four moves:-
UP, UP, LEFT, LEFT
Since all moves are equally costly, we compute g(n) as

$g(n) = 1 + 1 + 1 + 1$

$g(n) = 4$

Consider the following 8-puzzle instance:

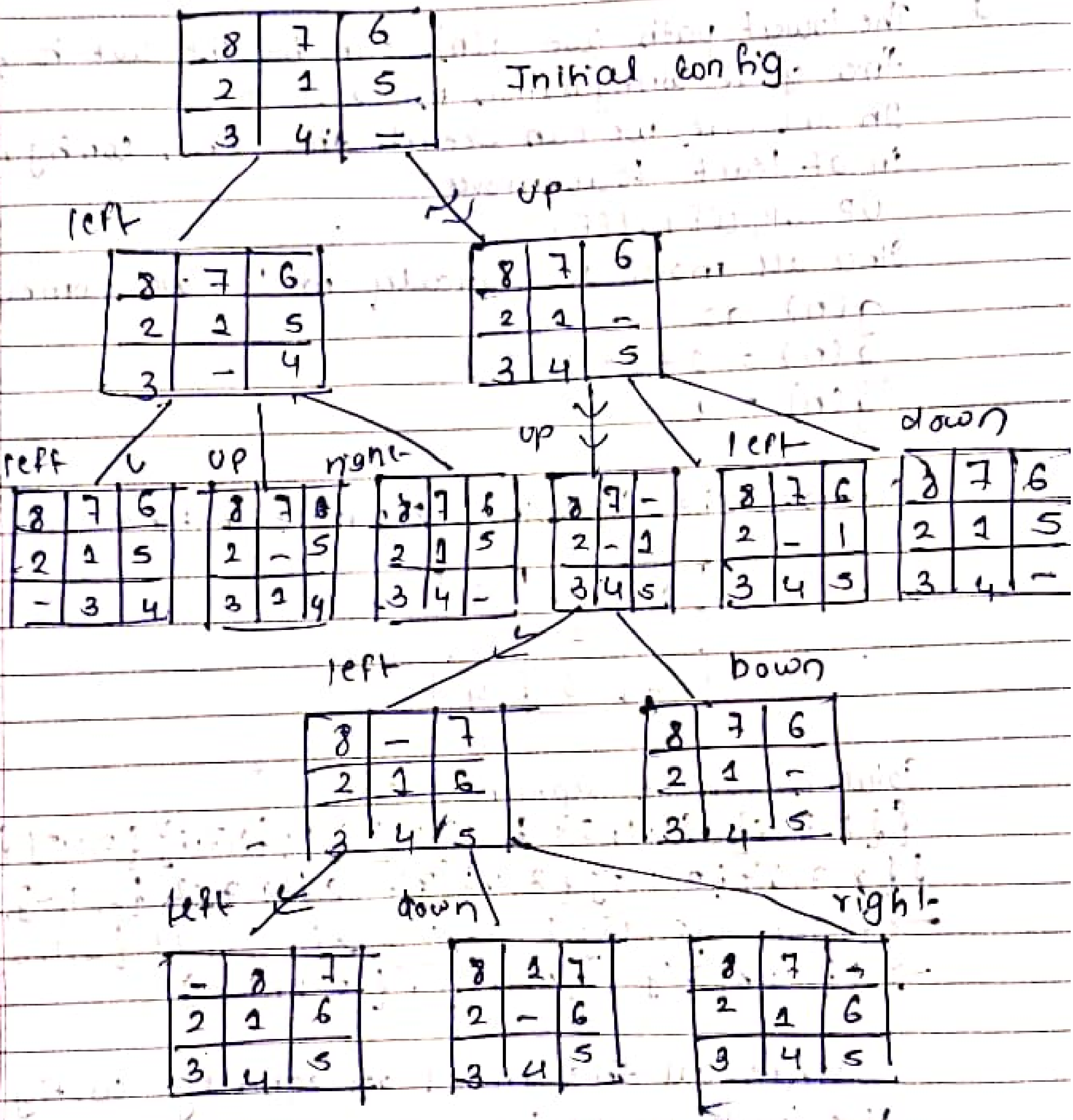
8	7	6
2	1	5
-	3	4

Solution can be represented as:
{{8,7,6} {2,1,5} {-,3,4}} → {{8,7,6} {2,1,5} {3,-,4}} →
{{8,7,6} {2,1,5} {3,4,-}} → {{8,7,6} {2,1,-}, {3,4,5}}
→ {{8,7,-} {2,1,5} {3,4,5}} → {{8,-,7} {2,1,6} {3,4,5}}
→ {{-,8,7}, {2,1,6}, {3,4,5}}

Since all the moves are equally costly the cost would be

$g(n) = 6.$

Q.



Final Configuration

c.

→

For $i = 1$, n = Initial state

h_1(initial) = misplaced tile count except space

h_1(initial) = 4

n = goal state

h_1(goal) = 0

For $i = 2$, n = initial state

h_2(initial) = Currently misplaced tile count except space

h_2(initial) = 4

for n = goal state

h_2(goal) = 1

For $i = 3$, n = initial state

for (initial) = sum of manhattan dist between current and correct position of all tiles except space

h_3(initial) = 0 + 0 + 0 + 0 + 1 + 1 + 1 + 1

= 4

For n = goal state

h_3(goal) = 0.