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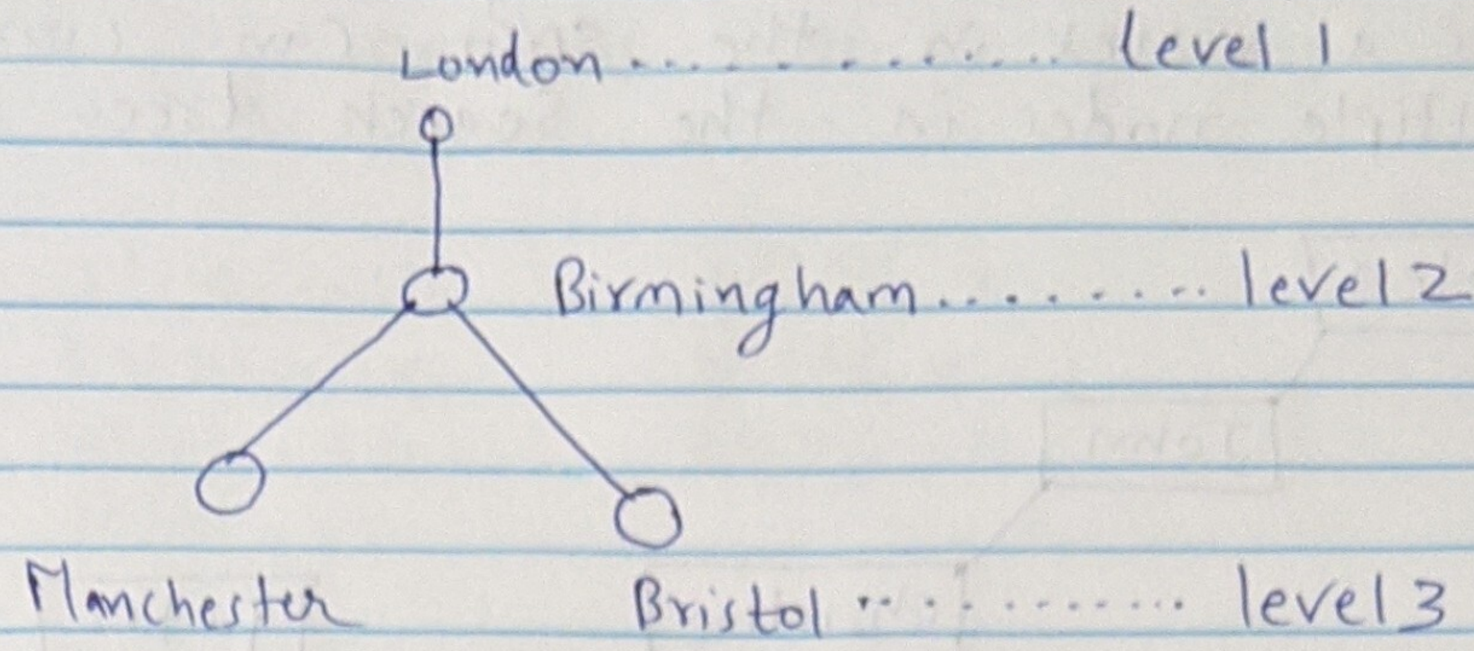
TASK-2 ASSIGNMENT-1.



BFS :- Dresden Leipzig Berlin Magdeburg Nuremberg

DFS :- Dresden Leipzig Magdeburg Hannover Bremen

UCS :- Dresden, Leipzig (119), Berlin (204), Magdeburg (244), Nuremberg (382)

IDS :- IT1 : Dresden
IT2 : Dresden Leipzig Berlin
IT3 : Dresden Leipzig Magdeburg Nuremberg Berlin

TASK-3

i) BFS :- Yes, BFS guarantees finding the correct number of degrees of separation between two people

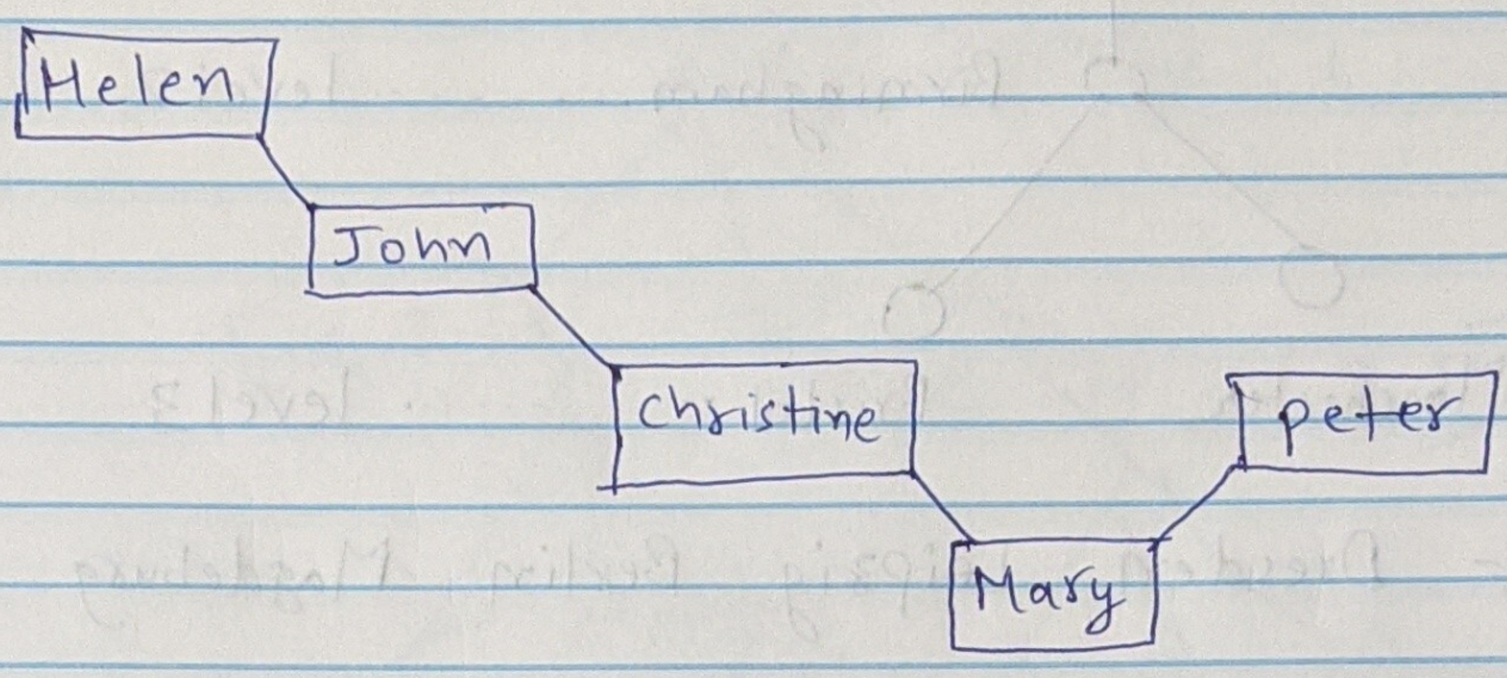
DFS :- No, DFS cannot give correct number.

UCS :- Yes, UCS Guarantees finding the correct number of degrees of separation.

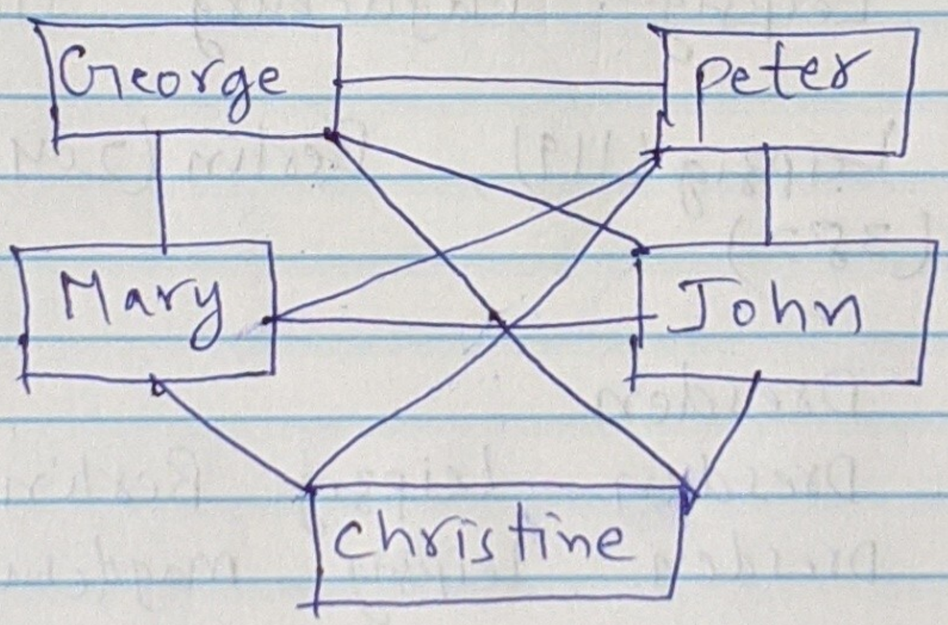
IDS :- Yes, given the initial depth is 0 & increments by 1.

ii) There is no one-to-one correspondence between the two as a vertex in the SNG can correspond to multiple nodes in the Search tree.

iii)



(iv)



(v) To make sure that memory required to store Search tree nodes will not exceed 1 GB, keep a list of visited states. Do not generate successor nodes corresponding to visited states.

TASK 4

Consider the optimal cost of getting from each node to the goal.

$h^*(A) = 17$
$h^*(B) = 14$
$h^*(C) = 10$
$h^*(D) = 12$
$h^*(E) = 7$
$h^*(F) = 4$
$h^*(G) = 0$

Any heuristic is admissible if it's values are less than (or) equal to these values.

Heuristic 1

corrected values

$h(A) = 20 \times (17)$
$h(B) = 15 \times (14)$
$h(C) = 5$
$h(D) = 0$
$h(E) = 5$
$h(F) = 5 \times (4)$
$h(G) = 5 \times (0)$

Heuristic 2

Admissible values

$h(A) = 20 \times (17)$
$h(B) = 20 \times (14)$
$h(C) = 20 \times (10)$
$h(D) = 20 \times (12)$
$h(E) = 20 \times (7)$
$h(F) = 20 \times (4)$
$h(G) = 20 \times (0)$

Heuristic 3

$h(A) = 2$
$h(B) = 0$
$h(C) = 2$
$h(D) = 0$
$h(E) = 2$
$h(F) = 0$
$h(G) = 2 \times (0)$

Admissible value

Heuristic 4

$h(A) = 0$
$h(B) = 2$
$h(C) = 0$
$h(D) = 2$
$h(E) = 0$
$h(F) = 2$
$h(G) = 0$

Heuristic 5

$h(A) = 0$
$h(B) = 0$
$h(C) = 0$
$h(D) = 0$
$h(E) = 0$
$h(F) = 0$
$h(G) = 0$

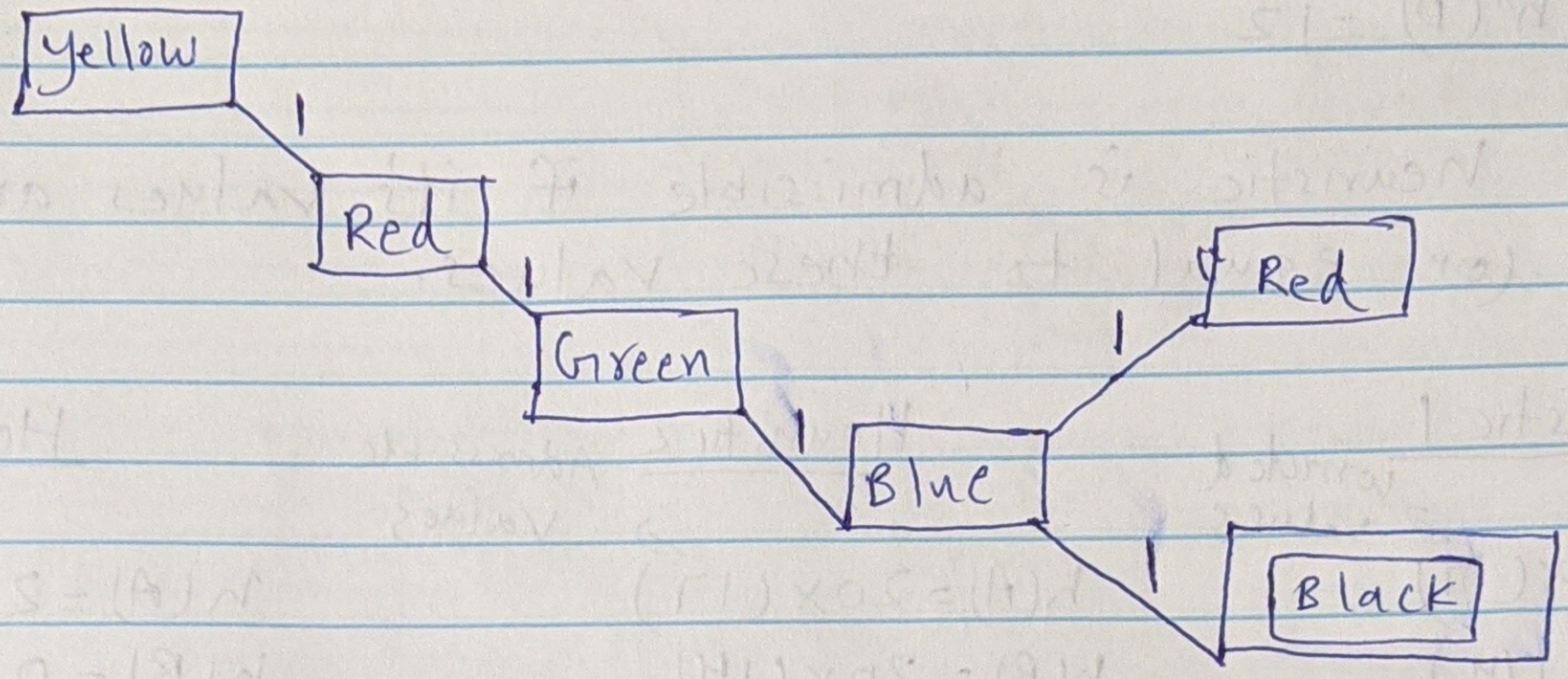
Heuristic 1 → Not Admissible
Heuristic 2 → Not Admissible
Heuristic 3 → Not Admissible

Heuristic 4 → Admissible
Heuristic 5 → Admissible

TASK 5

Let us assume that the cost of moving from one state to another is 1.

The smallest possible sequence of states generated with the given rules are.



From this, we get heuristic :-

h(Black) = 0
h(Blue) = 1
h(Green) = 2
h(Red) = 3
h(Yellow) = 4

This is the maximally Admissible heuristic

Task-6
Space complexity

BFS :- b^{d+1}
UCS :- $b^{F[C^*/\epsilon]}$
DFS :- bm
IDS :- bd

$b = 4$
$d = 100$ to 208
$C^* = 100$ to 208
$\epsilon = 1$
$m = \infty$

BFS — $[4^{101}$ to $4^{209}] * 1$ KB of memory
DFS — $4 * \infty * 1$ KB $= \infty$ KB of memory
UCS — $[4^{100}$ to $4^{208}] * 1$ KB of memory
IDS — $4 * [100$ to $208] = [400$ to $832] * 1$ KB of memory

(a) None of the methods can guarantee that you will never need more than 100 KB as all the methods shown above need way more than 100 KB

(b) IDS as shown above can guarantee that you will never need more than 1000 KB of memory