# Assignment 2 Harsh Saini - 1001571136

Answer 1.

BFS: A-> B -> C -> D -> E -> F -> G

DFS: A-> B -> D -> E -> C -> F -> G

IDS: A-> B -> C -> A -> B -> C -> D -> E -> F -> G

UCS: A-> C -> F -> G -> B -> E -> D

\*Assuming Preorder Traversals in the list

Answer 2.

1. ALL

ii)

John

George

Helen

Christine

Mary

1. Degree of Separation between John and peter is 4.

John

Christine

Mary

iv) All Connected Nodes. Degree of Separation 1.

Christine

Mary

Answer 3.

Heuristic 1: Admissible

Heuristic 2: Admissible

Heuristic 3: Not Admissible;

Value h(c)<=10

Value h(f)<=40

Heuristic 4: Admissible

Heuristic 5: Admissible

Answer 4.

H(Red): =70 -> Computed with the help of given information, the result stands out to be the best admissible heuristic for the given goal state.

H(Green): =50

H(Blue): =40

H(Yellow): >=0 (Since no information available)

H(Black)=0

Note: All Heuristics computed above show the best admissible value possible to reach goal state with respect to cost given.

Red

30

20

Blue

Green

40

50

Yellow

Black

Answer 5.

For 24-puzzle

* No of states = 25! = 1.551121004333098e25 = 1.55 x 1025
* Average Branching Factor = (4\*2 + 12\*3 + 9\*4) / 25 = 80/25 = 3.2

Explanation:

4\*2: Four corners and their two possibilities of movements.

12\*3: Edge nodes and their three possibilities of movements.

9\*4: Nine middle nodes and their four possible moves.

1. **50 KB constraint of memory: No method is suitable to work under this memory for the given puzzle.**

BFS: Requires bd Space, Not possible with this condition.

DFS: Requires minimum bm; m: shallowest depth, which in this case would be 101. Hence, minimum space required would be 3\*101>50.

Hence, DFS cannot be used.

IDS: Requires same space as DFS. Hence not possible here.

A\*: Requires same space to save all search nodes in the tree as of BFS, hence not possible to utilize with 50 KB memory.

IDA\*: Requires Depth nodes in the search queue. Hence, Minimum node to be found is at 101. Still not possible to utilize within 50 KB.

Hence, no algorithm is suitable to work under such little memory.

1. **1200 KB constraint of memory: DFS, Iterative deepening search and IDA\* find the goal in the given memory.**

BFS: Requires bd Space, Not possible with this condition. Since, 3^101(Best case of initial states) :1.54 e^48. Simply not possible with 1200 KB

DFS: Requires minimum bm; m: shallowest depth, which in this case would be 101. Hence, minimum space required would be 3\*101<1200 and similarly for the longest moves i.e. 3\*208<1200 . Hence, this algorithm will guarantee all process to be completed within 1200KB. Hence, DFS can be used.

IDS: Requires same space as DFS. Hence, possible here.

A\*: Requires same space to save all search nodes in the tree as of BFS, hence not possible to utilize with 1200 KB memory.

IDA\*: Requires Depth nodes in the search queue. Hence, Minimum node to be found is at 101 and farthest state at 208. Possible to utilize within 1200 KB.

Hence, DFS, IDS, IDA\* algorithm is suitable to work under 1200KB memory and guarantee solutions under this constraint.