CSE 4308 / 5360

ASSIGNMENT 2

Q.1

BFS: A, B, C, D, E, F, G //

DFS: A, B, E, F, C, D, G //

IDS:

IT 1 : A

IT 2 : A, B, C, D

IT 3 : A, B, E, F, C, D, G //

UCS

A(0), D(3), B(4), E(5), H(~~5~~), C(6), G(7)

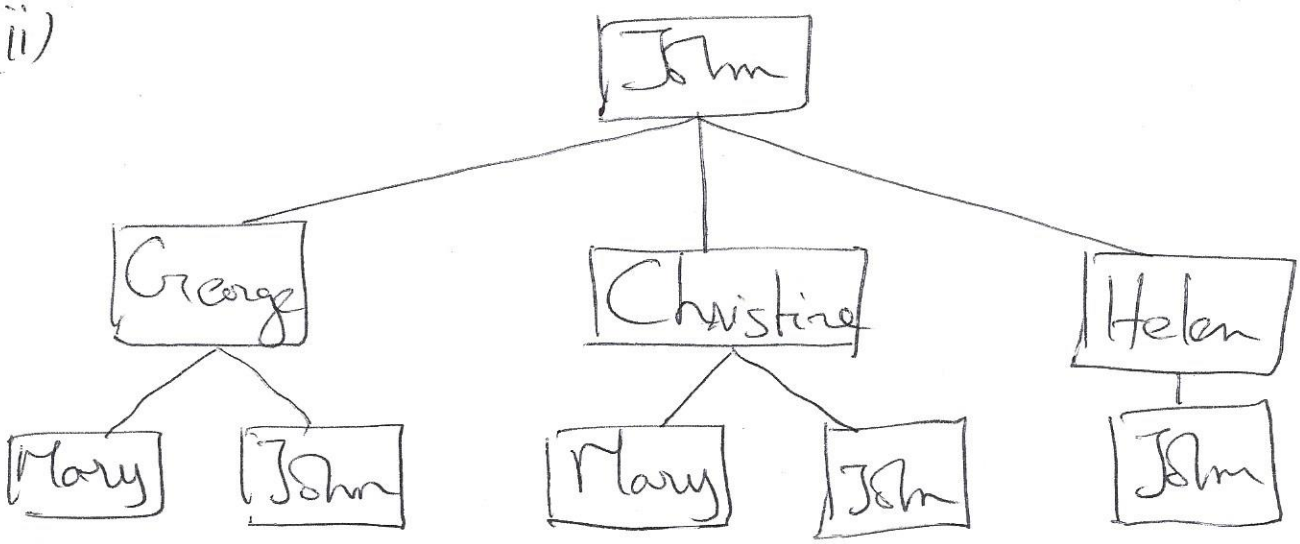
Q. 2

(i) BFS & UCS will behave the same. They will also give correct degrees of freedom

DFS can possibly never terminate. Even if it finds a solution, there is no guarentee that it is the correct one.

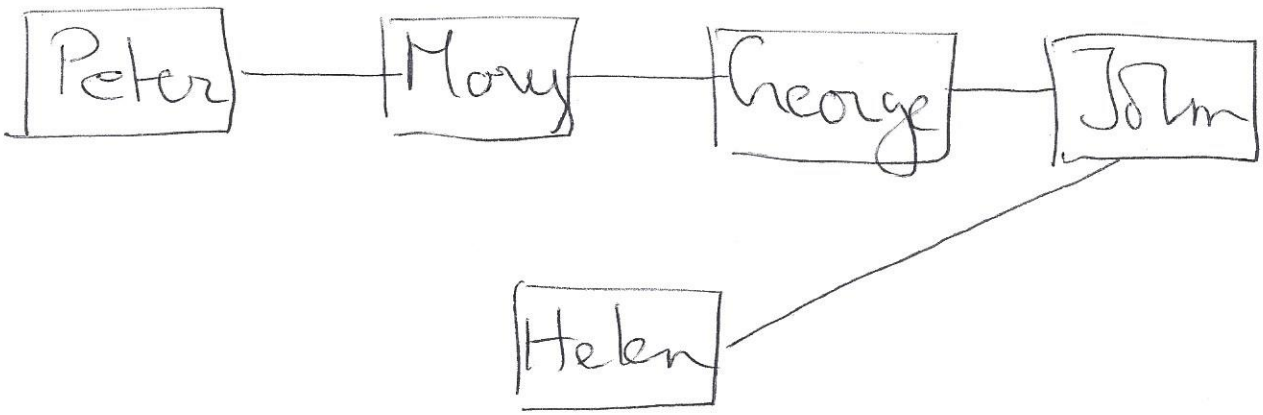
IDS: will provide the correct solution.

(ii)

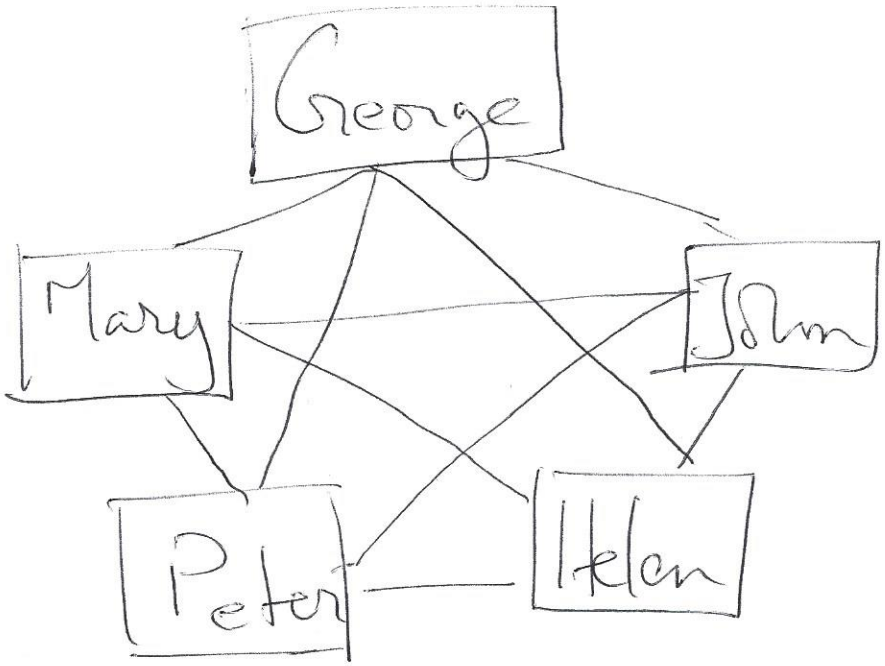


The vertex John in the SNA corresponds to multiple nodes in the search tree. So there is NO one-to-one correspondence between the two.

iii



(iv)



(v) Convert the tree search into a graph search.

(or)

Keep a list of visited states. Do not generate successor nodes for nodes corresponding to visited states.

Q(3.)

Consider the actual cost of getting from any node to goal.

$h^*(A) = 40$

$h^*(B) = 25$

$h^*(C) = 5$

$h^*(D) = 0$

$h^*(E) = 35$

$h^*(F) = 10$

A heuristic is admissible if its value are less than or equal to this value

Heuristic 1:

h(A) = ~~50~~ 30
h(B) = ~~35~~ 25
h(C) = 5 ✓
h(D) = 0 ✓
h(E) = ~~45~~ 35
h(F) = 10

Heuristic 2:

h(A) = ~~70~~ 30
h(B) = ~~70~~ 25
h(C) = ~~70~~ 5
h(D) = ~~70~~ 0
h(E) = ~~70~~ 35
h(F) = ~~70~~ 10

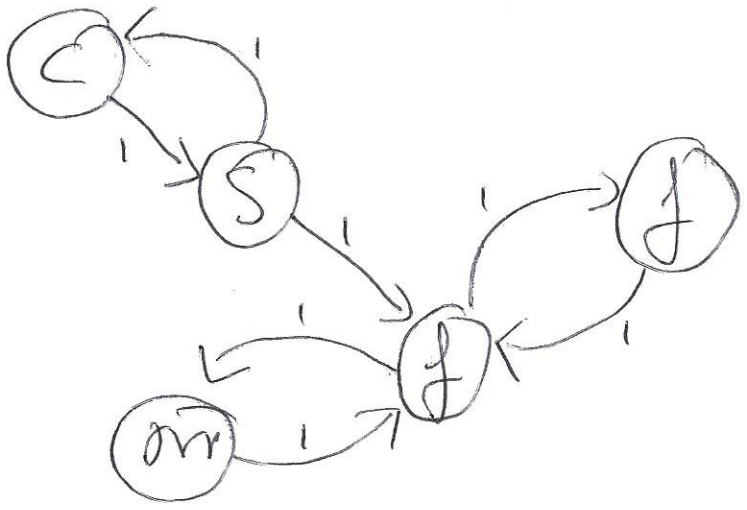
Heuristic 3:

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

} This is already admissible.

Q. 4.

Smallest possible sequence of states that is consistent with the rules is



From this we can get the heuristic as shown below

$$h(m) = 0$$
$$h(f) = 1$$
$$h(s) = 2$$
$$h(c) = 3$$

Q.5

$$b = 4$$
$$d = 101 \text{ to } 208$$
$$c^* = 100 \text{ to } 208$$
$$\epsilon = 1$$
$$m = \infty$$

Space complexity:

$$BFS = \left[4^{10+1} \text{ to } 4^{208+1}\right] \times 1\ KB \text{ memory}$$

$$DFS = 4 \times \infty \times 1\ KB \text{ memory}$$

$$UCS = \left[4^{10/1} \text{ to } 4^{208/1}\right] \times 1\ KB \text{ memory}$$

$$IDS = 4\left[10 \text{ to } 208\right] \times 1\ KB \text{ memory}$$

$$BFS = 2.57 \times 10^{61}\ KB \text{ to } 6.77 \times 10^{125}\ KB \text{ of memory}$$

$$DFS = \infty\ KB \text{ of memory}$$

$$UCS = 6.43 \times 10^{60}\ KB \text{ to } 1.69 \times 10^{125}\ KB \text{ of memory}$$

$$IDS = 404 \text{ to } 832\ KB \text{ of memory}$$

(a) None of the methods can run in less than 50 KB Memory

(b) IDS will run in less than 1200 KB of memory

Q.6

Fig 5

In some cases Greedy Search will perform the same as A^* [Ex: From 0,0 to 0,3]

However in some cases Greedy search will perform better than A^* [Ex From 0,0 to 3,3 (A^* will visit both 0,1 & 1,0 but greedy will only visit one of them)

So Greedy will perform better than or the same as A^* depending on start and end.

Fig 6

Sometimes Greedy performs better than A^* [Ex. 2,6 to 5,8]

Sometimes Greedy performs worse than A^* [Ex: 2,0 to 2,2]

Sometimes they perform the same [Ex: 2,2 to 2,7].

So Greedy will perform better than the same or worse than A^* depending on start and end locations.