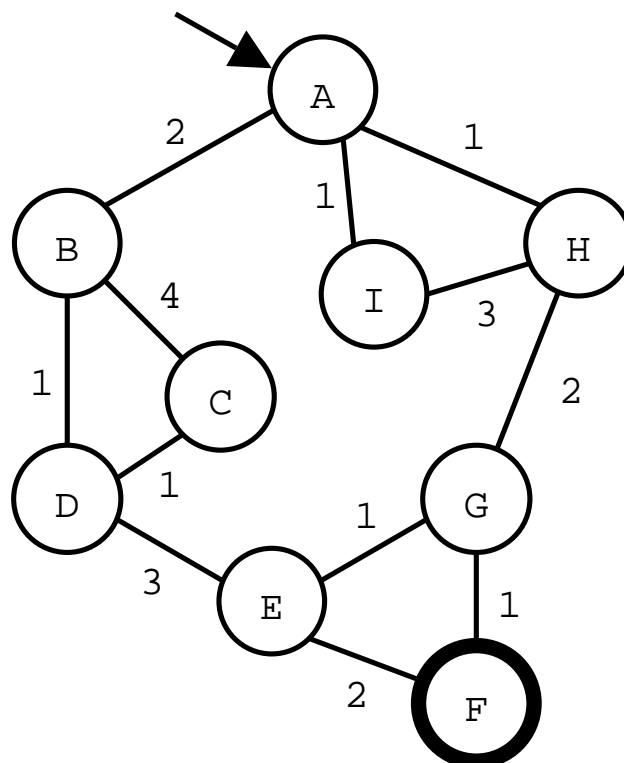


## CS347 SP2005 Quiz 1 Key

This is an open-book open-notes quiz. The *only* prohibited items are electronic devices. Mark every sheet of paper you use with your name and the string “cs347sp2005 quiz1” (omittance, even if it is partial, will be penalized at 1 point per sheet). If you are caught cheating, you will receive a zero grade for this quiz. The max number of points per question is indicated in square brackets after each question. The sum of the max points is 25. You have up to 25 minutes to complete this quiz. Good luck!

All the following questions are about the following state space graph, with A being the start state and F being the goal state. The order in which successors are generated is counterclockwise, ending at exactly 9 o'clock. Example: A generates first B, then I, and finally H. When sorting by path-cost, nodes with equal path-cost are ordered such that the earlier a node is generated, the higher its priority. Nodes already on the open list have higher priority than newly added nodes with equal path-cost.



1. Give the execution trace of BFTS. [7]

open	eval
A	A
BIH	B
IHDCA	I
HDCAHA	H
DCAHAIGA	D
CAHAIGAECB	C
AHAIGAECBDB	A
HAIGAECBDBBIH	H
AIGAECBDBBIHIGA	A
IGAECBDBBIHIGABIH	I
GAECBDBBIHIGABIHHA	G
AECBDBBIHIGABIHHAEFH	A
...	...
(all the nodes on the open list from A on the far left until F are now expanded)	...
...	...
F...	F

goal found; solution = AHGF; path-cost(AHGF)=4

2. Give the execution trace of UCTS. [8]

open	eval
A0	A0
I1H1B2	I1
H1B2A2H4	H1
B2A2A2G3H4I4	B2
A2A2G3D3H4I4A4C6	A2
A2G3D3I3H3H4I4A4B4C6	A2
G3D3I3H3I3H3H4I4A4B4C6	G3
D3I3H3I3H3H4I4A4B4E4F4H5C6	D3
...	...
(all the nodes on the open list from D3 on the far left until F are now expanded; note that any new nodes generated will have at least an f-value of four and will be placed to the right of F on the open list)	...
...	...
F...	F4

goal found; solution = AHGF; path-cost(AHGF)=4

3. Is BFTS optimal for this problem? Explain your answer! [2]

Yes, because it found a solution with the same path-cost as the one found by UCTS which in the answer to the next question is shown to be optimal.

4. Is UCTS optimal for this problem? Explain your answer! [2]

Yes, because the branching factor is finite, the step costs are all positive, and UCTS is always optimal under those conditions.

5. Is there a single step cost that can be changed in the state space graph which would make BFTS not complete? If yes, then give the action and new step cost; otherwise, explain why not. [3]

No, because the completeness of BFTS is dependent on  $b$  and  $d$ , it has nothing to do with the step costs.

6. Is there a single step cost that can be changed in the state space graph which would make UCTS not complete? If yes, then give the action and new step cost; otherwise, explain why not. [3]

Yes, changing, for instance, the step-cost of going from A to I to -2 creates a negative cycle in which UCTS will be stuck forever.