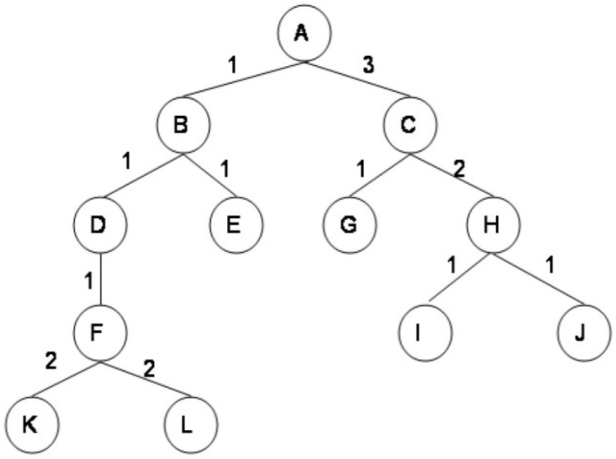
# Artificial Intelligence (CPCS-431)

## Exercises on Blind (Tree) Search

Consider the tree shown below. The numbers on the arcs are the arc lengths.




Assume that the nodes are expanded in alphabetical order when no other order is specified by the search, and that the goal is state G. What order would the states be expanded by each type of search? stop when you expand G.

1) Write only the sequence of states expanded by each search.

| | | |
|---|---|---|
| A | Breadth-first search | A,B,C,D,E,G. |
| B | Uniform cost search | A,B,D,E(c=3),C,G(c=4) |
| C | Depth-first search | A,B,D,F,K,L,E,C,G |
| D | Depth-limited search (l=3) | A,B,D,F,E,C,G |
| E | Iterative deepening search | I0: A<br>I1:A,B,C<br>I3:A,B,D,E,C,G |

2) What is the best algorithm for this particular problem? And why?

Breadth-first search
Because it reach the goal node (G) in the
minimum amount of steps

## Algorithm Properties

Calculate the time and space complexities and specify whether the above algorithms ar
optimal/complete or not.

| | Time-complexity | Space-complexity | Complete (yes/no) | Optimal (yes/no) |
|---|---|---|---|---|
| A | O(b^(d + 1)) | O(b^(d + 1)) | yes | yes |
| B | O(b^(1+C/ε)) | O(b^(1+C/ε)) | yes | yes |
| C | O(b^d) | O(b^d) | no | no |
| D | O(V^L) | O(V*L) | yes | no |
| E | O(b^d) | O(b*d) | yes | yes |