Answers

1. What search method do you think will find a solution in shortest time: breath-first or depth- first? Why? Reason about the answer without taking into account experimental results. (5 p)

DFS are probably going to find it first, as it goes through the tree from left to right, rather than from the top top the bottom. This means that BFS will always expand every node on the level before the goal, and probably about half on the goal level. DFS on the other hand will only expand about half the tree. The only case when BFS and DFS are equally slow are when the goal node is the rightmost node in the tree (assuming you walk through it from left to right). This is the case when the goal is near the bottom of the tree, which it is in our case. If the solution is further up the difference between them will be smaller and if the solution is at the top it is likely that BFS will be faster, as it doesn't have to go all the way to the bottom of the tree in order to realize the solution is wrong.

2. Write a program that solves this problem with the depth-first method. Execute the program for an 11x11 board leaving a maximum of 5 dirty nodes. Write down the number of nodes that were expanded. (15 p)

We expanded 4250 nodes.

3. Write a program that solves this problem with the breath-first method. Execute the program for a 11x11 board leaving a maximum of 5 dirty nodes. Write down the number of nodes that were expanded. (15 p)

We expanded 18374 nodes.

4. Write a program that solves this problem with the best-first method. Execute the program with the same scenarios as before. Write down the number nodes that were expanded. (5 p)

We expanded 4480 nodes. The method we used was to prioritize the paths where there were a lot of either clean tiles or no tiles (outside the map).

5. Compare the number of expanded nodes from the three methods. Will the "ranking" of methods be always the same, no matter which board size or allowed error is specified? (10 p)

The relation between BFS and DFS will always be the same because of DFS only exploring about half the tree when BFS explores alot more, see the reasoning in the first answer.
The best first search depends on which function we use to prioritize nodes with. However with most functions, the ranking will stay the same between different boards and errors.