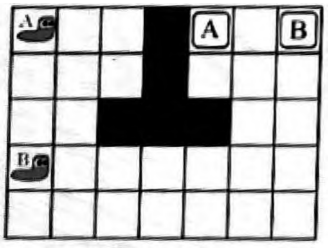
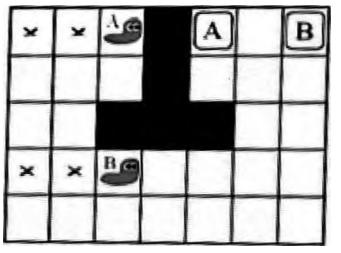
(b) In the left hand diagram below, a maze is represented by a grid in which the white squares are free space and the black squares *represent* fixed impassable walls. Two slugs A and B want to *exit* a maze via their own personal exits, which are at the squares marked A and B. At each time step, both slugs may either stay where they are or move to a horizontally or vertically adjacent free square. The slugs cannot move into a square that the other slug is moving into. In addition, the slugs leave behind a sticky, poisonous substance and so th灯 cannot move into any square that *either* slug has ever been in. For example, if both slugs move right twice, the maze is as shown in the right hand diagram below, with the *x* squares impassable to either slug.





Consider this situation as a search problem, whose solution is a sequence of mov挡 that get both slugs to their exit squares in as few time steg as possible. You may assume that the maze grid is of size *M* by *N* and that *W* of these squares are walls. Ybur answers should hold for a general maze of this kind, not simply the instance shown above. (Ybu do not need to generalize beyond two slugs.)

(i) Specify a representation that can represent any state in the search space of this search problem, and explain how this gives an upper bound on the number of states in the search space. Express this upper bound as a function of the grid size parameters *M* and *N* and the number of walls *W*.

[3 marks]

(ii) What is the maximum branching factor of the search space? Justify with a brief description of the successor function.

〔2 marks]

(iii) Give a non-trivial admissible heuristic for this problem.

\2 marks]