

2009 Paper 7 Question 4

Artificial Intelligence II

Evil Robot has almost completed his Evil Plan for the total destruction of the human race. He has two nasty chemicals, which he has imaginatively called *A* and *B* and which are currently stored in containers 1 and 2 respectively. All he has to do now is mix them together in container 3. His designer—an equally evil computer scientist—has equipped Evil Robot with a propositional planning system that allows him to reason about the locations of particular things and about moving a thing from one place to another.

- (a) Explain how this problem might be represented within a propositional planning system. Give specific examples of the way in which the start state and goal can be represented. [5 marks]
- (b) Describe in detail an algorithm that can be used to find a plan using this form of representation. [5 marks]
- (c) Give a specific example of a *successor-state axiom* using the representation you suggested in part (a). [2 marks]
- (d) Explain why in this particular planning problem it might be necessary to include one or more *precondition axioms* and give an example of such an axiom using your representation. [2 marks]
- (e) Explain why in this particular planning problem it might be necessary to include one or more *action exclusion axioms* and give an example of such an axiom using your representation. Suggest why it might be unwise to include too many axioms of this type, and explain how a reasonable collection of such axioms might be chosen in a systematic way. [4 marks]
- (f) Explain how in this problem it might be possible to include *state constraints* as an alternative to action exclusion axioms, and give a specific example of such a constraint using your representation. [2 marks]