

## 2010 Paper 4 Question 2

### Artificial Intelligence I

Evil Robot's creator has sent him on a mission. He must go to the Secret Mountain Hideout, put on an orange boiler suit so that he blends in, then pick up two items called Component 1 and Component 2 and join them together. Finally, he has to press the BIG RED BUTTON (which only works when the two components are joined together) in order to cause something horrible to happen. Evil Robot's internal systems have been constructed using the *situation calculus* and a theorem prover.

- (a) Give a brief outline of the *situation calculus*, concentrating on the fundamental elements that you would expect to see independently of any specific problem. [4 marks]
- (b) Suggest **three** logical formulae that might appear in Evil Robot's knowledge base in order to describe the initial state for the above problem. [3 marks]
- (c) Give an example of a *unique names axiom* that might appear in the knowledge base. Why might such axioms be required? [2 marks]
- (d) Give an example of a *unique actions axiom* that might appear in the knowledge base. [1 mark]
- (e) Give **two** examples of a *possibility axiom* that might appear in the knowledge base. [4 marks]
- (f) Give **two** examples of a *successor-state axiom* that might appear in the knowledge base. One of these should in addition address the *ramification problem*. Explain how it does this. [6 marks]