1 Artificial Intelligence I (SBH)

Evil Robot's dream of lasting romance remains, alas, just a dream. His latest obsession is a toasted sandwich-maker called SN00005833. In order to win her affections he plans to buy her a chocolate muffin from her favourite shop—*Fat Finbar's World of Cake*—before stealing a bunch of flowers from the local cemetery, gift-wrapping the presents, and presenting both gifts to her. Evil Robot's internal systems have been constructed using the *situation calculus* and a theorem prover.

(*a*) Describe the *situation calculus*, concentrating on the fundamental elements that you would expect to see independently of any specific problem.   [5 marks]

(*b*) Suggest *two* logical formulae that might appear in Evil Robot's knowledge base in order to describe the initial state for the above problem.   [2 marks]

(*c*) Give *two* examples of a *possibility axiom* that might appear in the knowledge base.   [4 marks]

(*d*) 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]

(*e*) Give *one* example of a *unique names axiom* and *one* example of a *unique actions axiom* that might appear in Evil Robot's knowledge base for this problem. Explain why such axioms are required.   [3 marks]