Computation Theory

Define computation by a register machine, explaining the action of the program. [4 marks]

What is meant by the current configuration during a register machine computation? [2 marks]

In the following program, assume that register $Z$ holds 0 initially. What is its effect?

```
START → a⁻ → s⁻ → EXIT 0
        ↓         ↓         ↓
  z' → s⁻ → z⁻ → EXIT 1
        ↓         ↓         ↓
  a' → z⁻ → s' → EXIT 1
```

[2 marks]

Show how to encode a general register machine program and the initial configuration of one of its computations into a pair of natural numbers. [6 marks]

Outline the design of a register machine that simulates a general register machine computation specified by a single natural number. Your machine should take appropriate action for all possible inputs. [6 marks]