

Worth: 2%**Due:** Before 10pm on **Thursday 22 March 2012.**

Remember to write your full name and student number prominently on your submission.

Please read and understand the policy on Collaboration given on the Course Information Sheet. Then, to protect yourself, list on the front of your submission **every** source of information you used to complete this homework (other than your own lecture and tutorial notes, and materials available directly on the course webpage). For example, indicate clearly the **name** of every student with whom you had discussions, the **title** of every additional textbook you consulted, the **source** of every additional web document you used, etc.

For each question, please write up detailed answers carefully. Make sure that you use notation and terminology correctly, and that you explain and justify what you are doing. Marks **will** be deducted for incorrect or ambiguous use of notation and terminology, and for making incorrect, unjustified, ambiguous, or vague claims in your solutions.

1. A *majority element* in an array is an element that appears in **more than** half of the array locations.

Consider the following algorithm that finds a majority element in an array, if one exists.

```
MAJORITY(A):  
    c = 1  
    m = A[0]  
    for i = 1 to len(A) - 1:  
        if c == 0:  
            m = A[i]  
            c = 1  
        else if A[i] == m:  
            c = c + 1  
        else:  
            c = c - 1  
    return m
```

- (a) Give precise preconditions and postconditions for this algorithm.
- (b) Write a detailed proof that the algorithm is correct. (This includes, but is not limited to, finding and proving a suitable loop invariant.)