

## 2002 Paper 4 Question 1

### Concurrent Systems and Applications

Below are four potential problems and two proposed solutions for each one. For each of the problems, give a brief example showing the proposed solutions and explain the advantages and disadvantages of each.

- (a) Data held in one object is to be made available throughout a large, possibly distributed, application.
  - (i) Store the data in a field with the `public` modifier.
  - (ii) Store it in a field with the `private` modifier but provide `public` methods to access its value.
  
- (b) A class `C` implements an interface `I1` but some code is designed to access it through an alternative interface `I2`. The two interfaces support similar operations.
  - (i) Define a new class using inheritance.
  - (ii) Use the *Adapter* design pattern.
  
- (c) You are designing a data structure and need to decide how to perform concurrency control in case it is used in a multi-threaded application.
  - (i) Use `synchronized` methods (or other features) to make the methods safe for concurrent use.
  - (ii) Do not manage concurrency here and add comments to the source code.
  
- (d) You have a class that defines how to communicate with a remote server using a TCP socket. The connection is established in the constructor and you must decide how to close it.
  - (i) Provide an explicit `close` method in your class.
  - (ii) Use a `finalize` method.

[5 marks each]