3 Programming in C and C++ (SCC)

In this question, where appropriate, you may use a short fragment of code to complement your explanation.

(a) (i) What is the difference between a local and global variable in C? (Consider variable scope, storage and initialisation.)

(ii) What are the properties of a static member variable in a C++ class?

[4 marks]

(b) (i) Briefly explain pointer arithmetic in C. Give an example code snippet involving pointers in which it would be inappropriate to use pointer arithmetic, and explain why.

(ii) Explain how in some respects pointers are equivalent to arrays, and give one respect in which they differ.

[4 marks]

(c) Explain why a function might be declared virtual in a C++ superclass.

[4 marks]

(d) (i) How does use of the void * pointer in C allow a form of polymorphism? Give an example function declaration using the void * pointer.

(ii) What is the main problem with the use of void *, and how does C++ improve on this? Give the improved function declaration in C++ for your example function in part (d)(i).

[4 marks]

(e) (i) Why might it be useful to define a copy constructor for a C++ class? Give an example of a copy constructor for a simple class.

(ii) Why might it be useful to explicitly define the assignment operator (=) for a C++ class? Give an example definition of the assignment operator for a simple class.

[4 marks]