

5 Programming in C and C++ (djc11)

- (a) Are C functions exactly the same as C++ functions? What is the difference between a C function and C++ method? [3 marks]
- (b) The C language is used on a range of microcontrollers where the number of bits used for the `char` type might have any value between 8 and 16, but `int` always uses 24 bits. Write a program that determines the number of bits present in a `char`. [3 marks]
- (c) On another computer, `char` variables are 8-bits in size, but it is not known if they are signed and unsigned. Write a program to test which. [3 marks]
- (d) C++ is object oriented.
- (i) Can C++ upcasts and downcasts always be checked for type safety at compile time? [3 marks]
- (ii) Give an example of a C++ upcast that requires the object pointer to be adjusted. [3 marks]
- (iii) Give an example where a C++ downcast is checked for validity at run time. What is needed for validity to be checked by the language runtime system? [3 marks]
- (e) Say why and whether you would expect the following fragment to work:

```
char *mys = "ab_de";  mys[2] = 'c';
```

[2 marks]