

4 Programming in C and C++ (djg11)

- (a) BCPL was a precursor to C. It stored character strings using a byte initialised to  $l$ , the length of the string, with the characters of the string held in the following bytes. What differences arise from the C method for storing character strings?

[3 marks]

- (b) A dictionary data structure in C stores key/value pairs where both elements are character strings. Entries are created or updated using

```
void insert(const char *key, const char *value)
```

Discuss whether the caller or callee should be responsible for allocating store for the strings. What consequences could arise if a caller mutates its local copy of a key?

[5 marks]

- (c) Students have been told that, in many situations, C array declarations are interchangeable with C pointer declarations. Rather than using a shared header file, a student writes `extern char *mydata;` at top-level directly in a `.c` file. Their program does not work. A friend changes it to `extern char mydata[];`. Might this change make any difference to compiler errors/warnings or run-time operation? Would a shared header file (`.h`) help?

[6 marks]

- (d) Stating any assumptions made, and considering endianness, describe what happens inside the compiler and at run time for each of the following type casts.

```
extern double f1;
int i1 = (int)f1;
char *p2 = (char *)&i1;
int i3 = (int)(*p2);
```

[6 marks]