1 Programming in C and C++ (djg11)

(a) (i) In programming languages in general, what is the difference between
statically and dynamically-allocated variables? Without using the static
keyword, give examples of both types of variable in the C language.

(ii) What effect do the static and extern keywords have in C for both forms
of variable?

(b) There are 32 characters in the ASCII set between ‘A’ and ‘a’. All are printable.
A potentially-infinite stream of 8-bit bytes can be made printable by encoding
into base 32 and represented by a longer stream just using these characters.
Give a syntactically-accurate definition in C for encode32(unsigned char a),
called for each byte, which invokes putchar(char c) once or twice per call to
render the encoded output.

(c) Show how the for statement in C can be used to traverse a linked list. Explain
the benefits of this coding style, mentioning whether the continue statement
works appropriately.

(d) typedef char * mystring;
    mystring s201 = "201";
    mystring s202 = s201;
    s202[2] += 1;

A novice programmer writes the above code. What do you think they are
intending to do and what two problems might they suffer?

(e) An interpreter for a string processing language is written in C. Describe four
storage and efficiency-related considerations when designing the module for
storing strings for the interpreter?