GX1335

OLLSCOIL NA hÉIREANN
National University of Ireland, Galway

SUMMER EXAMINATIONS 1999/2000

B.A. Degree Examination
B.A. Degree Examination (Economic and Social Studies)

ALGORITHMS AND PROGRAMMING (CT472)

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Time Allowed : **Two Hours**

Answer question one and any two other questions

1. (a) Describe what is meant by (i) a counter-controlled loop, and (ii) a sentinel-controlled loop, in terms of initialisation, termination and making progress. *(10)*

(b) Develop a piece of code in the C programming language to process a list of 100 student marks. The code should display how many people got honours (mark ≥ 70), how many people passed ($40 \leq$ mark ≤ 70) and how many people failed (mark < 40). You may assume that all marks are valid, i.e. in the range 0 - 100. *(10)*

(c) Develop a piece of code in the C programming language to total a bill, where the user will enter a list of prices corresponding to items bought. The code should display the total amount due. State clearly any assumptions you make. *(10)*

(d) There are 9870 people in a town whose population increases by 10 percent each year. Write a loop in C that displays the annual population and determines how many years it will take for the population to exceed 15,000. *(10)*

2. (a) Describe the selection sort algorithm for sorting an array of integers. Demonstrate how the algorithm works using the example array : *(15)*

15	9	-3	18	12	-1

(b) A function which is used often in the selection sort algorithm is the swap function. Develop a function in the C programming language to swap the values contained in two variables. *(10)*

(c) Show how the function you wrote in (b) would be called to swap the values of variables *a* and *b*, both declared as integers. *(5)*

3. (a) Describe what is meant by an end-of-file controlled loop. Give the general form of such a loop. *(10)*

(b) Develop a piece of C code which opens a file called `temp.dat`, containing a list of integer values representing temperatures in the Fahrenheit scale. Your code should convert each temperature to its Celsius equivalent and produce a new file called `celsius.dat` containing the converted temperatures. You should give declarations for any variables you use. *(15)*
The formula for converting Fahrenheit to Celsius is:

$$celsius = 5/9\ (fahrenheit - 32)$$

(c) With respect to your code for (b), what would happen if (i) the file `temp.dat` does not exist, (ii) a file `celsius.dat` already exists? *(5)*

4. (a) Write a note on how strings are represented in C. *(5)*

(b) Develop a piece of C code to search a string `str` for the position (index) of the first uppercase letter. You may assume that there is at least one uppercase letter in the string. *(10)*

(b) Develop a piece of C code to read a string representing a car registration number, and which displays on screen the county code. You may assume that the string representing the registration number is made up of a two digit year, followed by a space, followed by a one or two letter county code, followed by a space, followed by one or more digits. You may also assume that the county code is uppercase.
Examples of the use of the code are:
For the input "00 G 2875", the county code "G" should be displayed;
for the input "94 WX 914", the county code "WX" should be displayed. *(15)*

5. (a) A music company requires a software system to handle their music cd's. As part of the development teach you are asked to define a C structured data type `track_t`, representing tracks on a cd, with the components `track_title`, `artist_name`, and `length`. Give a declaration of a variable `t` of this type. *(5)*

(b) Write a function, called `scan_track`, to scan information into a structure of type `track_t`, and show how your function would be called with your variable `t` from (a). *(10)*

(c) Based on `track_t`, define a structured data type `cd_t` that has the components `title`, `id` and `tracks`. You may assume that a cd will hold no more than 15 tracks *(5)*

(d) Develop a piece of C code to declare a variable `cd1` of type `cd_t` and then reads the details of a cd into the new variable. *(10)*