

PRIFYSGOL CYMRU; UNIVERSITY OF WALES

DEGREE EXAMINATIONS JANUARY 2003

SWANSEA

Computer Science

CS 111 Program Design

Attempt 2 questions out of 3

Time allowed: 2 hours

Students are permitted to use the dictionaries provided by the University

Students are NOT permitted to use calculators

CS_111
PROGRAM DESIGN
(Attempt 2 questions out of 3)

Question 1

It has been suggested that we define a record to store the following information about students:

surname	(max 20 characters)
first names	(max 30 characters)
sex	(male or female)
date of birth	(day, month, year)
modules taken plus results in those modules	(exactly 12 modules)
average mark for modules taken	(a real number)

(Note this entry will be calculated and not read from a file)

- a. Define a set of suitable types, constants and variables to enable this data to be read from a text file (the name of which is to be input to the program), and stored in an array of records.

[10 marks]
- b. Define a set of procedures to read in this information into the array. In what format should a file be constructed to allow it to be read by your procedures? Carefully explain the options you have considered in defining this format.

[10 marks]
- c. Discuss the changes that you would make if it was decided to store the information in a linked list rather than an array.

[5 marks]

Question 2

- a. There are three main ways of constructing a loop in Delphi/Pascal. For each way give the syntax and explain clearly how it is determined how many times the body of the loop is executed.

[7 marks]

- b. Write functions or procedures to perform the following tasks.

- i) `readints`, which will read from a text file (the name of which is passed as a parameter), an unknown number of integer values (all on one line separated by spaces), and return as the result the sum of those values.

[6 marks]

- ii) `answeryorn`, which will repeatedly ask the user to respond with a single character answer until the user answers with a valid character, which should be a 'Y', 'y', 'N', or 'n', returning as the result the value `true` if the character was a 'Y' or 'y', and `false` if the character was 'N' or 'n'.

[6 marks]

- iii) `writeints`, which given an array of integers declared to be of type `intarray` (see below), and an integer, `n`, less than or equal to 50 writes out to a text file (the name of which is passed as a parameter), the first `n` values in the array, on one line.

Assume that the following declarations have been made

```
const maxindex = 50;
      maxvalue = 100;
type  indexrange = 1..maxindex;
      valuerange = 1..maxvalue;
      intarray = array[indexrange] of valuerange
```

[6 marks]

Question 3

- a. Delphi/Pascal defines two forms of formal parameters (variable and value parameters).

Write procedures or functions to perform the following tasks and explain carefully in each case why you have selected to use the style of parameter you have. In each case also include definitions of any additional types, or variables which you require.

- i) `swap`, which will exchange the contents of two integer variables
[3 marks]

- ii) `display`, which given a two dimensional array of the following type will print it out to the screen in a neat format (one row per line) with each row and column labelled (by a number) except the last of each which should be labelled TOTAL.

```
type entries = 1..999;  
    displayarray = array[1..10,1..12] of entries
```

[5 marks]

- iii) `maxentry`, which will find the maximum value in an array of type
`maxarray = array[1..10] of integer;`
[5 marks]

- iv) `wheremax`, which will produce a set containing the positions of all values equal to the maximum value in the array.
[6 marks]

- b. Given the following definition of a type to represent a date define a procedure to add 3 weeks to a given date.

```
type day = 1..31;  
month = (jan, feb, mar, apr, may, jun,  
         jul, aug, sep, oct, nov, dec);  
year = (1901..2099);  
date = record dy: day;  
            mo: month;  
            yr: year  
end;
```

[6 marks]