

OLLSCOIL NA hÉIREANN, GAILLIMH
NATIONAL UNIVERSITY OF IRELAND, GALWAY

SEMESTER 1 EXAMINATIONS 2003/2004

B.A. Degree Examination
B.A. (International) Degree Examination

ALGORITHMS AND PROGRAMMING (CT472)

Professor D. Bell;
Professor G. Lyons;
Dr S. Flynn.

Time allowed: Two hours.

Candidates should attempt question one and any two other questions.

1. (a) One important aspect of loops is *making progress*. Explain what the term *making progress* means, and demonstrate how it may be achieved in (i) a counter-controlled loop; (ii) a sentinel-controlled loop; (iii) an EOF-controlled loop. (10)
- (b) As part of a global warming analysis, a research facility tracks outdoor temperatures at the North Pole once a day, at noon, for a year. At the end of each month, these temperatures are entered into a computer and processed. The operator will enter 28, 29, 30 or 31 data items, depending on the month. You may use -500 as a sentinel value after the last temperature, since that is lower than absolute 0. Write a piece of C code that will read the data values for one month and then compute the following information : the average temperature for the month; the number of days in the month on which the noon temperature exceeds 32 degrees Fahrenheit; the number of days in the month on which the noon temperature exceeds the average temperature. You may assume that all inputs are in degrees Fahrenheit. (20)
- (c) Extend your solution to (b) to find the first date (i.e. the day number within the month) on which the noon temperature exceeds 32 degrees Fahrenheit. Your solution should be as efficient as possible. (10)

5. (a) Distinguish between the following aspects of a variable: type, address, name and value. Illustrate your answer with examples. (8)

- (b) Consider the following piece of code, and answer the questions below:

```
void paws(int *a, int *b)
{
    int t;

    t = *a;
    *a = *b;
    *b = t;
}
```

```
void fun(int *i1, int *i2, int *i3)
{
    if (*i1 > *i2)
        paws(i1, i2);
    if (*i2 > *i3)
        paws(i2, i3);
    if (*i1 > *i2)
        paws(i1, i2);
}
```

- (i) Which of the following function calls are legal (give reasons): (4)

- fun(6, 10, 2)
- x = fun(x, y, x)
- fun(&x, &y, &z)

(assume the declarations int x = 6, y = 10, z = 2;)

- (ii) What does the function fun do? Illustrate your answer by tracing an example. (8)

- (c) Develop a function in C which takes as input a period of time in days, and converts this to weeks and days, returning both values. Show how your function would be called. (10)

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