OLLSCOIL NA hÉIREANN, GAILLIMH

NATIONAL UNIVERSITY OF IRELAND, GALWAY

Gx 2004

SUMMER EXAMINATIONS 2004

Second arts and Science examinations

CS207 – Languages and Operating systems

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Time allowed: *two* hours.
Answer *three* questions.

1. (a) If r is the nominal rate and i is the effective rate, then $1 + i = (1 + r/m)^m$ when interest is compounded m times per year. Give a sequence of Maple commands that calculate the effective rate of interest when:
   i. 3% is compounded quarterly,
   ii. 2% is compounded monthly.

   (b) Write a Maple command, using loops, to find the sums accumulated when €1,000 is invested for 5, 10, or 15 years at interest rates of 2%, 4% or 6%.

2. Write a Maple procedure `iep2eur` which converts from Irish pounds to Euro. (1 euro = IR£0.787564).

   (a) The Ackermann function $A : \mathbb{N} \times \mathbb{N} \to \mathbb{N}$ is defined as follows:

$$A(m,n) = \begin{cases} n+1 & m = 0, \\ A(m-1,1) & m > 0 \text{ and } n = 0, \\ A(m-1, A(m,n-1)) & \text{otherwise.} \end{cases}$$

   Write a Maple procedure that implements the Ackermann function.

3. (a) Write a C function which converts degrees from Fahrenheit to Celcius according to the formula $C = \frac{5}{9}(F - 32)$ where F is Fahrenheit and C is Celcius.

   (b) Write one or more C functions which together implement the Bubble sort algorithm.

4. (a) Write a C function which finds the greatest common divisor of two numbers.

   (b) Write a C function which merges two lists, assumed to be in non-decreasing order, and returns a list whose terms are those of the given list, also in non-decreasing order.