考試科目	計算機概論	所別	資訊科學	考試時間	3月19日(上/下)午第1節 星期六

1. (10%) Explain what is hashing? What determines the quality of a hash function? If we use remainder of division as hash function, what would be a good way to select a divisor?

2. (10%) A process is said to be I/O-bound if it requires a lot of I/O operations, whereas a process that consists of mostly computations within the CPU/memory system is said to be compute-bound. If both a compute-bound process and an I/O-bound process are waiting for a time slice, which should be given priority? Why?

3. (25%) Expression and variable evaluation.
   (1) What is the value of the expression (`3 * 8 / 6 % 3 * 7`)?
   (2) If `a = 1, b = 4, c = 5`, after the expression (`a += b *= c -= 3`) is evaluated, what is the value of `a, b, c,` respectively?
   (3) If originally `x = 3`, after the evaluation of (`x += x + 3`), what is the value of x?
   (4) If originally x = 1, y = 2, what is the value of the evaluation (`--x + y++`)?
   (5) If originally x = 3, y = 2, z = 1, what is the value of x, y, and z after executing the following code?

```
if ( z = x < y)
  {
   x += 3 ;
   y -= 1 ;
  }
else
   x = y++ ;
```

4. (10%) Explain what is *heap*, `malloc`, and `free`?

5. (10%) A power series is a mathematical series in which the *i*-th term involves raising some quantity to the *i*-th power. Write a program segment to calculate the sum of the power series 1/2 + 1/4 + 1/8 + 1/16 + 1/32 + ... Your program should include a repetitive loop and return the sum as accurate as possibly allowed by the floating point notation in the computer. (Hint: The number in the power series gradually reduces to zero.)

6. (10%) Design a finite-state machine to recognize either 'he' or 'she' as an input string. When the two strings are recognized, output an 'accept' signal. Otherwise, output a 'reject' signal. Note that a string ends with a 'blank'.

備考	試題隨卷繳交

命題委員： 043 （簽章） 94 年 3 月 4 日

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7. (15%) Two programmers, Ann and Ben, are given the problem of dividing a group (of an even number of people) into two disjoint subgroups of equal size so that the difference between the total ages of each subgroup is as large as possible. Ann proposes the solution of forming all possible subgroup pairs, computing the difference between the age totals of each pair, and selecting the pair with the largest difference. On the other hand, Ben proposes that the original group first be sorted by age and then divided into two subgroups by forming one subgroup from the younger half of the sorted group and the other from the older half.
   (1) What is the complexity of each of these solutions?
   (2) Is the problem itself of polynomial, or non-polynomial complexity?

8. (10%) Design a recursive algorithm for printing a linked list backwards. Indicate the base case and the general case in your algorithm.

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