

國立清華大學命題紙

96 學年度 資訊系統與應用 系(所) 乙 組碩士班入學考試

科目 計算機概論 科目代碼 2301 共 2 頁第 1 頁 \*請在【答案卷卡】內作答

- 1 (15%) Given a tree with  $n$  vertices,
  - (a) (5%) What is the maximum number of edges in this tree?
  - (b) (5%) What is the minimum number of edges in this tree?
  - (c) (5%) Please prove your answer.
  
2. (a) (5%) Explain why it can only use  $BUFFER\_SIZE-1$  elements in the following program.

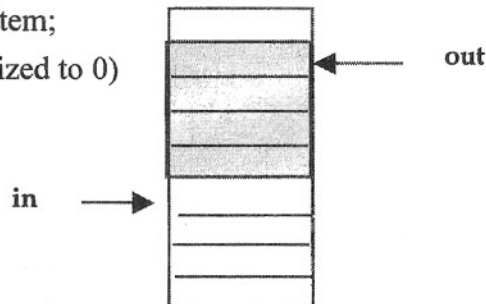
Implement the buffer as a circular array:

```
var buffer: array[1..n] of item;  
    in, out: 0..n-1; (initialized to 0)
```

next free:  $in$

first available:  $out$

empty:  $in=out$



- (b) (5%) If you can add one more variable to your program, what variable should you add in order to use all buffer elements. Please explain your answer.
  
3. (10%) Draw the diagram of hardware address protection, including the base and limit registers.
  
4. (15%) Please answer the following questions shortly.
  - (a) (5%) What is the difference between Memory-Mapped I/O and Program I/O?
  - (b) (5%) What is the difference between programming language C and C++?
  - (c) (5%) In a program, what is the difference between function and procedure?
  
5. (10%) What is the difference between “Software Engineering” and “Capability Maturity Model for Software (CMM)””? Please give specific examples to illustrate your answer.

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6. (15%) An assertion is a logical proposition that can be true or false. We can make assertions about the state of the developed program. The general concept behind formal program verification is that we can make assertions about what the program is intended to do, based on its specifications, and then prove through a logical argument that a design or implementation satisfies the assertions.

(a) (8%) Please explain the meaning of following program.

```
#include <assert.h>
cin >> newValue;
assert(cin);
inFile.open("data.in");
assert(inFile);
```

(b) (7%) Although executable assertions can be valuable tools, there is one serious drawback to their use. Please explain it.

7. (15%) Given the following function:

```
int Puzzle(int base, int limit)
{
    if (base > limit)
        return -1;
    else
        if (base == limit)
            return 1;
        else
            return base * Puzzle(base + 1, limit);
}
```

Show what would be written by the following calls to the recursive function Puzzle. Note that explanation is necessary. Same answer to all questions or no explanation will be treated as zero mark directly.

(a) (5%) cout << Puzzle (0, 0)

(b) (5%) cout << Puzzle (4, 7)

(c) (5%) cout << Puzzle (14, 10)

8. (10%) Briefly explain the terms “Isolated I/O” and “Memory-Mapped I/O”. Please give at least one physical example to illustrate your answer. Besides, what are the main differences between them?