

四川大学期末考试试题（闭卷）

(2016~2017 学年第 1 学期)

B 卷

课程号: 311143040 课程名称: 系统级编程 任课教师:

适用专业年级: **软件工程 2014 级** 学号: 姓名:

考生承诺

我已认真阅读并知晓《四川大学考场规则》和《四川大学本科学生考试违纪作弊处分规定（修订）》，郑重承诺：

- 1、已按要求将考试禁止携带的文具用品或与考试有关的物品放置在指定地点;
- 2、不带手机进入考场;
- 3、考试期间遵守以上两项规定,若有违规行为,同意按照有关条款接受处理。

考生签名:

题 号	一(40%)	二(10%)	三(10%)	四(10%)	五(10%)	六(10%)	七(10%)
得 分							
卷面总分			教师签名		阅卷时间		

注意事项: 1. 请务必将本人所在学院、姓名、学号、任课教师姓名等信息准确填写在试题纸和添卷纸上;

2. 请将答案全部填写在本试题纸上;
3. 考试结束, 请将试题纸、添卷纸和草稿纸一并交给监考老师。



评阅教师	得分

一、单项选择题（本大题共 20 小题，每小题 2 分，共 40 分）

提示: 在每小题列出的四个备选项中只有一个是符合题目要求的, 请将其代码填写在下表中。错选、多选或未选均无分。

[illegible]

1. When using a debugger to find the cause of a program's incorrect behavior
 - (A) it is fastest to start by stopping the debugger long before the behavior appears
 - (B) the program is usually executed to the point at which the behavior occurs and then executed backwards to find the cause
 - (C) it is often necessary to start the program multiple times under the debugger
 - (D) the faulty code fragment must first be identified
2. Consider the following fragment of C++ source code.

```
String msg; unsigned int x; int y;  
cin >> msg >> x >> y;      cout << x + y;
```

注：试题字迹务必清晰，书写工整。

.....

本题共 12 页, 本页为第 1 页

教务外试题编号: 311-32

Which of the following is (are) true regarding execution of the segment?

- I. The input statement will always take the same amount of time to execute.
- II. The output statement will always be executed immediately after the input statement.
- III. If x and y are both positive, an integer greater than both will be printed.

- (A) II only
- (B) I and II only
- (C) II and III only
- (D) none

3. Which one will translate the incoming file into assembly file

- (A) Preprocessor
- (B) Assembler
- (C) Linker
- (D) Loader

4. Select the correct statement regarding execution of the segment? `x=1; x=x<<31;`

- (A) x holds a negative value
- (B) x holds a positive value
- (C) It is hard to determine whether x is positive or negative.
- (D) The value of x is 7FFFFFFF in hexadecimal;

5. In a computer with 8-byte words, which of the following C expressions tests whether ptr contains the address of a word?

- I. `(ptr & 7) == 0`
- II. `(ptr | 7) == 0`
- III. `(ptr % 8) == 0`

- (A) II only
- (B) I only
- (C) III only
- (D) I and III only

6. Can a program sum several integers and produce a result greater than 0x7FFFFFFF correctly?

- (A) Yes, but only when execute on a 64-bit system
- (B) Yes, even when execute on 32-bit system, if the program is special designed.
- (C) No, if execute on a 32-bit system
- (D) No, neither 32-bit nor 64-bit system, because of the overflow

7. Which expression does not represent the same value as other three expressions? `int arr[10]={0};`

- (A) arr++;
- (B) &arr[1]
- (C) arr+1
- (D) &arr[2]-1

8. Given the following code segment, which statement is TRUE?

```
int a; int c; static double b; int *pa=&a; double *pb=&b; pb++;
```

- (A) *pb=5; will NOT modify the values in variables a and c;
- (B) *pb =5; will only modify the value in variable a;
- (C) *pb =5; will only modify the value in variable c;
- (D) *pb =5; will modify the values in variables a and c;

9. In C, assuming that an int takes 4 bytes, how many bytes are required to represent the following array? int a[12][2][5];

- (A) 480
- (B) 120
- (C) 40
- (D) 96

10. In one computer, the bytes with addresses A, A+1, A+2 and A+3 contain the integer 256, and the variable declared with int * a; has the value A. In a different computer, the bytes with addresses B, B+1, B+2 and B+3 also contain the integer 256, and the variable declared with int * b has the value B. Which of the following are necessarily true?

I. The contents of A are equal to the contents of B+3.

II. The contents of B are equal to the contents of A+3.

III. *a == *b

- (A) ALL
- (B) III only
- (C) I and III only
- (D) II and III only

11. Which of the following are true of the effect that optimizations have on the machine code generated by compilers?

I. The resulting code will be faster and/or smaller.

II. The resulting code will be clearer.

III. The resulting code will be harder to debug.

- (A) I and III only

(B) I, II, and III

(C) I only

(D) I and II only

12. Which of the following is a good reason (are good reasons) to equip the CPU with small amounts of fast memory?

I. To make the design of the compiler simpler

II. To make some CPU instructions smaller

III. To make some CPU instructions faster

(A) II only

(B) II and III only

(C) III only

(D) I, II, and III

13. What is the job of a loader?

(A) translate the C code into machine code

(B) Resolution

(C) load or map the Executable object file from the disk to memory

(D) manage memory for programs

14. Which of the following is normal skill of making program run faster?

I. Faster Loops

II. Avoiding Expression Repetitions

III. Eliminating Unneeded Memory Allocation

(A) I and II only

(B) I and III

(C) I, II, and III

(D) II and III only

15. An implicit dynamic memory allocators can

(A) Automatic allocation and reclamation

(B) Automatic allocation and explicit reclamation

(C) Explicit allocation and automatic reclamation

(D) Explicit allocation and reclamation

16. Suppose a compiler uses static storage to store all variables, function parameters, saved registers, and return addresses. Which of the following language features can this compiler support?

I. Local variables.

II. Function calls.

III. Recursion.

(A) II only

(B) I, II, and III

(C) I and II

(D) I only

17. In order to optimizing program performance, we should know

I. What is the hot spot

II. Understanding the some feature of that processor on which the program will run

III. All the system calls that the program uses.

(A) I only

(B) I and II

(C) II and III

(D) I, II, and III

18. What is right about Exception Handler?

I. It is used for handle exception

II. It may not return

III. It may return to the instruction where exception happens

(A) I and II

(B) I and III

(C) I, II and III

(D) II only

19. Read the following code, and How can we optimize it?

```
void lower(char *s) {
```

```
int i;
for (i = 0; i < strlen(s); i++)
    if (s[i] >= 'A' && s[i] <= 'Z')
        s[i] -= ('A' - 'a');
}
```

- (A) Enhancing Parallelism
- (B) Reducing Procedure Calls
- (C) Loop Splitting
- (D) Reducing Pointer Dereferences

20. A memory hierarchy

- (A) makes programs execute more slowly but allows them to be bigger.
- (B) limits programs' size but allows them to execute more quickly.
- (C) is a way of structuring memory allocation decisions.
- (D) takes advantage of the speed of SRAM and the capacity of disk.

评阅教师	得分

Problem 2 (10 Points) : Bit operation

Complete the following functions according to the following rules.

In 32-bit system, each "Expr" is an expression using ONLY the following:

1. Integer constants 0 through 255 (0xFF), inclusive.
2. Function arguments and local variables (no global variables).
3. Some of the problems restrict the set of allowed operators. You are expressly forbidden to:
 - Use any control constructs such as if, do, while, for, switch, etc.
 - Define or use any macros.
 - Define any additional functions in this file.
 - Call any functions.
 - Use any other operations, such as &&, ||, -, ?, or [] :
 - Use any form of casting.
4. You may assume that your machine:
 - Uses 2s complement 32-bit representations of integers.
 - Performs right shifts arithmetically.
 - Has unpredictable behavior when shifting an integer by more than the word size.

/*

* tMIN - Returns the minimum two's complement integer

* Bytes numbered from 0 (LSB) to 3 (MSB)

* Legal ops: ! ~ & ^ | + << >>

```
*    Max ops: 4
*/
int tMIN() {

}

/*
* CountNoneZeroByte - Returns the number of none zero byte in integer x
* For example: x= 0xff000001, CountNoneZeroByte(x) will return 2
* Bytes numbered from 0 (LSB) to 3 (MSB)
* Legal ops: ! ~ & ^ | + << >>
* Max ops:20
*/
int CountNoneZeroByte (int x) {

}

}
```

评阅教师	得分

Problem 3 (10 Points) : Improve the performance.

(10 points) Suppose $n!$ is referred for dozens of times in a project by several functions. The value of n is selected by the user from a fixed range (from 1 to 64). Please describe how to design your algorithm or program to gain (1) maximum speed; or (2) minimum object file size. (clue : object file size depends on numbers of instructions and static variables)

评阅教师	得分

Problem 4 (10 Points) : The stack discipline. This problem deals with stack frames in Intel IA-32 machines.

1. (4 pts) Explain how the following assembly instructions affect program counter.
- ```
call dword ptr ds:[3992BCh]
ret
```



2. (6pts) Draw the basic structure of a stack frame in the following table (top: higher address). You are expected to fill in at least formal parameters, return address, ebp and local variables.

|  |
|--|
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |

| 评阅教师 | 得分 |
|------|----|
|      |    |

**Problem 5 (10 Points) : Garbage Collection.**

Describe the basic ideas of garbage collection algorithms including Mark/Swap, Copy Collecting, Reference Counting, and Generational Garbage Collection.

| 评阅教师 | 得分 |
|------|----|
|      |    |

**Problem 6 (10 Points) : Performance Optimization**

Given the following program: Please optimize procedure **sum**, and explain the reason you do so in details.

```
#include <time.h>
#include <stdlib.h>
#include <stdio.h>

struct Vector
{
 int dimensions;
 int *store;
};

int get_data(struct Vector * pVector, int i){
 return pVector->store[i];
}

int get_length(struct Vector * pVector){
 return pVector->dimensions;
}

void init_Vector(struct Vector *pVector){
 int i;
 srand((unsigned)time(NULL));
 pVector->dimensions = rand()%1000;
 pVector->store = (int *)malloc(sizeof(int)*pVector->dimensions);
 for (i=1; i<=pVector->dimensions; i++)
 pVector->store[i-1]=i;
}

void sum(struct Vector *pVector, int *val){
 int i;
 for (i=0; i<get_length(pVector); i++){
 *val += get_data(pVector, i);
 }
}

int main(int argc, char* argv[])
{
 struct Vector myVector;
 myVector.dimensions=100;
 int sum = 0;
 init_Vector(&myVector);
 sum(&myVector, &sum);
 printf("length:%d \t sum:%d\n",myVector.length, sum);
 return 0;
}
```

| 评阅教师 | 得分 |
|------|----|
|      |    |

**Problem 7 (10 Points) : Cache**

A computer system has just two caches (L1 and L2) between the CPU and memory. A program running on this computer performs read operations for 10000 times, and causes 1000 misses on L1, 200 misses on L2. Assume the access times of the levels:  $T_1$  (L1 cache) = 1 ns,  $T_2$  (L2 cache) = 4 ns,  $T_m$  (Memory) = 100 ns. Please calculate the hit ration of L1 and L2, and the total time spent on all of these read operations.