四川大学期末考试试题（闭卷）

（2019~2020 学年第 1 学期）　　B 卷

课程号：**311233050**　课程名称：**操作系统和系统编程**　任课教师：＿＿＿＿

适用专业年级：**软件工程 2018 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(20%)	三(40%)
得　　分				
卷面总分		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。

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

1. Suppose that, using a tool such as the memory window of Visual C++, we found that a certain set of contiguous memory locations contained the integer 0xC605CD623A8365000000. What could these memory locations hold?

I. the integer 0xC605CD623A8365000000

II. a string

III. a CPU instruction

(A) I and II

(B) II

(C) III

(D) all of above

2. 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) all of above

(B) II and III

(C) I and II

(D) I and III

3. Which of the following numerical operations is most likely to lead to loss of precision?

(A) Integer addition

(B) Floating-point addition

(C) Integer multiplication

(D) Floating-point multiplication

4. Which register is used to hold the counter value in assembly?

(A) EDX

(B) EAX

(C) EBX

(D) ECX

5. Consider the following code.

```
float a[5]={1.1, 2.2, 3.3, 4.4, 5.5};
float x = *((float *) (((char*) &a[0]) + 4))+2;
```

If float and integer are 32 bits wide, which of the following values is equal to x?

(A) 7.5

(B) 4.2

(C) 5.3

(D) 6.4

6. The C expression (*a).b is equivalent to

(A) (&a) + b

(B) a->b

(C) &a.b

(D) *(a->b)

7. About heap memory, which statement is incorrect?
   (A) Memory leak is cause by a failure to free allocated memory
   (B) Free a static local variable with free() will not cause memory leak
   (C) Free allocated memory twice will trigger a run time error.
   (D) Heap memory can only be freed by certain functions.
8. About garbage collector, which statement is incorrect?
   (A) frees memory blocks that cannot be reached by dereferencing pointers
   (B) Reference counts can be used in implementations of garbage collectors
   (C) When using mark and sweep algorithm, only half of the heap space can be used.
   (D) Copying collection can be used in implementations of garbage collectors
9. In the process of Software Optimization Process, what should do first?
   (A) find the Hotspots
   (B) think of better Algorithm or using better Data structure
   (C) using better Data structure
   (D) set compiler for better performance.
10. At what time can linking happen?

    I.compile time II.load time III.run time

   (A) I and II
   (B) II and III
   (C) I and III
   (D) I, II and III
11. An example of a consumable resource is the following:( )
   (A) messages
   (B) main memory
   (C) printers
   (D) all of the above
12. The principle objective of a time sharing, multiprogramming system is to ( )
   (A) Maximize response time
   (B) Maximize processor use
   (C) Provide exclusive access to hardware
   (D) None of the above
13. A Control/Status register that contains the address of the next instruction to be fetched is called the:

(A) Instruction Register (IR)
(B) Program Counter (PC)
(C) Program Status Word (PSW)
(D) All of the above

14. A semaphore that does not specify the order in which processes are removed from the queue is called a
(A) Binary semaphore
(B) Strong semaphore
(C) Weak semaphore
(D) Mutex

15. Concurrency plays a major part in which of the following specific contexts
(A) Structured applications
(B) Multiple applications
(C) O/S structure
(D) All of the above

16. Fixed file blocking experiences the following potential problem:
(A) Internal fragmentation
(B) Gaps due to hardware design
(C) External fragmentation
(D) None of the above

17. The following disk scheduling policy is useful as a benchmark against which to evaluate other disk scheduling policies because it provides a worst-case scenario:
(A) fifo scheduling
(B) random scheduling
(C) priority scheduling
(D) none of the above

18. There are four jobs arrived at the same time and the execution time of each job is 2h. Now they run on one processor at single channel,then the average turnaround time is
(A) 1h
(B) 5h
(C) 2.5h
(D) 8h

19. In memory management, the purpose of using the overlay and swapping is
(A) Sharing main memory

(B) Expanding main memory physically

(C) Saving main memory space

(D) Improving CPU utilization

20. The replacement policy that is impossible to implement because it would require the O/S to have perfect knowledge of future events is called the

(A) Least recently used (LRU) policy

(B) Clock policy

(C) None of the above

(D) Optimal policy

评阅教师	得分

二、简答题（本大题共 **4** 小题，共 **20** 分）

1. Please briefly describe spatial locality and temporal locality.

2. In static linking, linker works two-pass. Please briefly describe linker's work.

3. If the resource allocation as shown in the table, is the system safe? If process P2 requests resources (1,2,2,2) at this time, can the system allocate resources to it? Why?

Process	Allocation	Need	Available
P_0	0032	0012	1622
P_1	1000	1750	
P_2	1354	2356	
P_3	0332	0652	
P_4	0014	0656	

4. Consider a system that allocates pages of different sizes to its processes. What are the advantages of such a paging scheme? What modifications to the virtual memory system are provide this functionality?

评阅教师	得分

三、问答题（本大题共 4 小题，每小题 10 分，共 40 分）

1. Code optimization. This program will output a reversed string. Please optimize its performance.

```
void main() {
	int i;
	char str[] = "This program will revser the string!";
	reverse(str);
	puts(str);
}

void swap(char *a, char *b) {
	int temp = *a;
	*a = *b;
	*b = temp;
}

void reverse(char str[]) {
	char *ptemp = (char *)malloc(strlen(str) + 1);
	strcpy(ptemp, str);
	int i=0, j =strlen(str) - 1;
	for (; i <= strlen(str) /2; i++, j--)
		swap(&ptemp[i], &ptemp[j]);

	strcpy(str, ptemp);
	free(ptemp);
	ptemp = NULL;
}
```

2. Stack discipline. Consider the following C code and its corresponding 32-bit x86 machine code. Please complete the stack diagram on the following page.

```
int sum2(int a, int b) {
    int   c= a+b;
    return c;
}

int sum4(int w,int x, int y, int z) {
    int m;
    m = sum2(y,z)+sum2(w,x);
    return m;
}
```

```
int sum2(int a, int b) {
00411730  push        ebp
00411731  mov         ebp,esp
00411733  sub         esp,04h
0041173C  lea         edi,[ebp-04h]
00411742  mov         ecx,1h
00411747  mov         eax,0CCCCCCCCh
0041174C  rep stos    dword ptr es:[edi]
00411758  mov         eax,dword ptr [ebp+0ch]
0041175B  add         eax,dword ptr [ebp+8h]
0041175E  mov         dword ptr [ebp-4h],eax
00411761  mov         eax,dword ptr [ebp-4h]
}
```

```
int sum4(int w,int x, int y, int z) {
00411860  push        ebp
00411861  mov         ebp,esp
00411863  sub         esp,08h
0041186C  lea         edi,[ebp-08h]
00411872  mov         ecx, 02h
00411877  mov         eax,0CCCCCCCCh
0041187C  rep stos    dword ptr es:[edi]
00411888  mov         eax,dword ptr [ebp+14h]
0041188B  push        eax
0041188C  mov         ecx,dword ptr [ebp+10h]
0041188F  push        ecx
00411890  call        sum2 (04113ACh)
00411895  add         esp,8
00411898  mov         esi,eax
0041189A  mov         edx,dword ptr [ebp+0ch]
0041189D  push        edx
0041189E  mov         eax,dword ptr [ebp+08h]
004118A1  push        eax
004118A2  call        sum2 (04113ACh)
004118A7  add         esp,8
004118AA  add         esi,eax
004118AC  mov         dword ptr [ebp-4h],esi
004118AF  mov         eax,dword ptr [ebp-4h]
}
```

Draw a detailed picture of the stack, starting with the caller invoking sum4(5,6, 7, 8), and ending immediately before execution instruction in address 00411761 from function call to the underlined sum2(w,x) . The diagram starts with the address for arguments of sum4(). Fill in constant values if possible, or EBP/RA /UNKNOWN/variable name for uncertain values.

0x0018FE04	
0x0018FE00	
0x0018FDFC	
0x0018FDF8	
0x0018FDF4	
0x0018FDF0	
0x0018FDEC	
0x0018FDE8	
0x0018FDE4	

0x0018FDE0	
0x0018FDDC	
0x0018FDD8	
0x0018FDD4	
0x0018FDD0	
0x0018FDCC	
0x0018FDC8	
0x0018FDC4	
0x0018FDC0	

3. Perform analysis as the following Table for the following sequence of disk track requests: 186, 64, 129, 79, 115, 17, 101, 10, 120. Assume that the disk head is initially positioned over track 100 and is moving in the direction of decreasing track number.

FIFO		SSTF		SCAN		C-SCAN	
Next track accessed	Number of tracks traversed	Next track accessed	Number of tracks traversed	Next track accessed	Number of tracks traversed	Next track accessed	Number of tracks traversed
Average seek length		Average seek length		Average seek length		Average seek length	

4. A museum can accommodate up to 100 people to visit at the same time. There is an entrance. Only one person is allowed to pass through the entrance and exit at a time. Use Semaphore describing the above process.