四川大学期末考试试题（闭卷）

（2019~2020 学年第 1 学期）　　A 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. Which expression will evaluate to 0x1 if x is a multiple of 32 and 0x0 otherwise? Assume that x is an unsigned int.
   (A) !(x & 0x1f)
   (B) !(x & 0x3f)
   (C) (x & 0x1f)
   (D) (x | 0x3f)
2. Where is the first argument to a function located in 32-bit assembly code, immediately after the call instruction is executed?
   (A) ebp + 0x4

(B) ebp - 0x4

(C) esp + 0x4

(D) esp - 0x4

3. What section of memory holds the assembly for printf?

(A) Stack

(B) Kernel memory

(C) Heap

(D) Shared libraries

4. In the following code, what order of loops exhibits the best locality?

```
// int a[X][Y][Z] is declared earlier
int i, j, k, sum = 0;
for (i = 0; i < Y; i++)
    for (j = 0; j < Z; j++)
        for (k = 0; k < X; k++)
            sum += a[k][i][j];
```

(A) i on the outside, j in the middle, k on the inside (as is).

(B) j on the outside, k in the middle, i on the inside.

(C) k on the outside, i in the middle, j on the inside.

(D) The order does not matter.

5. A memory hierarchy

(A) takes advantage of the speed of SRAM and the capacity of disk.

(B) makes programs execute more slowly but allows them to be bigger

(C) is a way of structuring memory allocation decisions.

(D) limits programs' size but allows them to execute more quickly.

6. A 256-byte 4-way set associative cache with 16 byte blocks has

(A) 4 sets

(B) 8 sets

(C) 16 sets

(D) 64 sets

7. 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) II and III only

(D) I, II, and III

8. What is the minimum (most negative) value of a 32-bit two's complement integer?

(A) -2^{32}

(B) -2^{31}

(C) $-2^{32} + 1$

(D) $-2^{31} + 1$

9. The advantage of using copying gc including

I. A copying collector is generally more efficient than a non-copying collector

II. The copying gc can make use of heap memory effectively.

(A) I

(B) II

(C) both of them

(D) none of them

10. What is the most likely immediate result of executing the following code:

```
int foo[10]
int *p = (int *) malloc(4*sizeof(int));
p = p - 1;
*p = foo[0];
```

(A) Initialize the first array element to 4

(B) Corruption of malloc header information

(C) Reset the pointer p to point to the array named foo

(D) Segmentation fault

11. The system configuration that includes an i/o module which is a separate processor with a specialized instruction set can be referred to using the following terminology:

(A) i/o channel

(B) i/o processor

(C) direct memory access (DMA)

(D) all of the above

12. Indexed sequential files similar to sequential files, but contain two added features:

(A) Hash function and an overflow file

(B) Hash function and file index

(C) File index and overflow file

(D) All of the above

13. The data structure that maintains information on available disk space is called the:
    (A) Disk Allocation Table
    (B) Bit Table
    (C) File Allocation Table (FAT)
    (D) None of the above
14. The reason of process scheduling by Round Robin (RR) is
    (A) Every terminal can be responded in time.
    (B) FCFS
    (C) The process with high priority can be reponded in time.
    (D) The process which needs least time can be dispatched.
15. ( ) of memory management supports multiprogramming. It is simple to implement but usually contains many internal fragments.
    (A) Segmentation
    (B) Paging
    (C) Fixed Partitioning
    (D) Combined Paging and Segmentation
16. A process switch may occur when the system encounters an interrupt condition, such as that generated by a ( )
    (A) Memory fault
    (B) Supervisor call
    (C) Trap
    (D) All of the above
17. 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
18. A conservative strategy for dealing with deadlocks that involves limiting access to resources and imposing restrictions on processes is called ( ):
    (A) Deadlock Detection
    (B) Deadlock Prevention
    (C) Deadlock Avoidance

(D) None of the above

19. 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

20. An example of a consumable resource is the following:( )

(A) messages

(B) main memory

(C) printers

(D) all of the above

评阅教师	得分

二、简答题（本大题共 **4** 小题，共 **20** 分）

1. (6 分) Describe the locality the following code shows up.

```
sum = 0;
for (i = 0; i < MAX; i++)
    sum += array[i];
```

2. (4 分) For each of the following assignment statements, fill in the blanks in the comments to indicate the result of the assignment. All answers must be in hex.

Consider the following code, being executed on a Little Endian Pentium machine where
sizeof(int) == 4
sizeof(int *) == 4
sizeof(char) == 1

```
int main() {
        int array[2];
        int * ptr;
        int x;
        char c;
        array[0] = 0xaabbccdd;
        array[1] = 0x44556677;
        ptr = array;
        x = *((int *)ptr + 1);          /* x = 0x_____*/
        c = *((char *)ptr + 1);         /* c = 0x_____*/
        x = *((char *)ptr + 1);         /* x = 0x_____*/
        c = *((int *)ptr + 1);          /* c = 0x_____*/
}
```

3. (5 分) Consider a simple paging system with the following parameters: 2^{32} bytes of physical memory; page size of 2^{10} bytes; 2^{16} pages of logical address space. Fill you answer in the corresponding bracket.
   a. How many bits are in a logical address? ( )
   b. How many bytes in a frame? ( )
   c. How many bits in the physical address specify the frame? ( )
   d. How many entries in the page table? ( )
   e. How many bits in each page table entry? Assume each page table entry contains a valid/invalid bit. ( )

4. (5 分)Please describe the conditions of deadlock.

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. Floating point encoding

Consider the following 9-bit floating point representation based on the IEEE floating point format:

- The most-significant bit is the sign bit.
- The next four bits are the exponent.
- The least-significant four bits are the significand.

Please write down the binary representation for the following (please show details of encoding). Recall that for denormalized numbers, E = 1-bias. For normalized numbers, E = e-bias.

Value	Format A Bits
One	
Three	
7/8	
-11/8	
+INF	

2. Describe a buffer overflow exploit you could use to make exploitMe return true if the stack grew down. You do not need to write the exploit, just describe how it would work.

```
int exploitMe() {
        char password[100];
        /*prompt the user for the password*/
        printf("what is the password?\n");
        /*read it in*/
        gets(password);
        printf("You shall not pass!\n");
        return false;
}
```

3. Consider the following string of page references 6, 2, 1, 1, 2, 3, 4, 5, 2, 1, 0, 3, 2. And the memory space of this system only has FOUR pages. Complete the following blanks, showing the frame allocation for:
   a. FIFO (first-in-first-out)
   b. LRU (least recently used)
   c. Clock
   d. Optimal (assume the page reference string continues with 2, 2, 6, 3, 0, 0, 1)
   e. List the total number of page faults and the miss rate for each policy. Count page faults only after all frames have been initialized.

	6	2	1	1	2	3	4	5	2	1	0	3	2
FIFO	6	6 2	6 2 1	6 2 1	6 2 1	6 2 1 3							
LRU													
Clock (mark * when use bit is 1)													
Optimal													

	Total number of page faults	The miss rate
FIFO		
LRU		
Clock		
Optimal		

4. There are two face recognition gates（Automatic Ticket Checker ） in the amusement park. The gate can enter or leave. Only one person can pass through the gate at a time. It is necessary to ensure that the tourists leave first when queuing up. Use Semaphore describing the above process.