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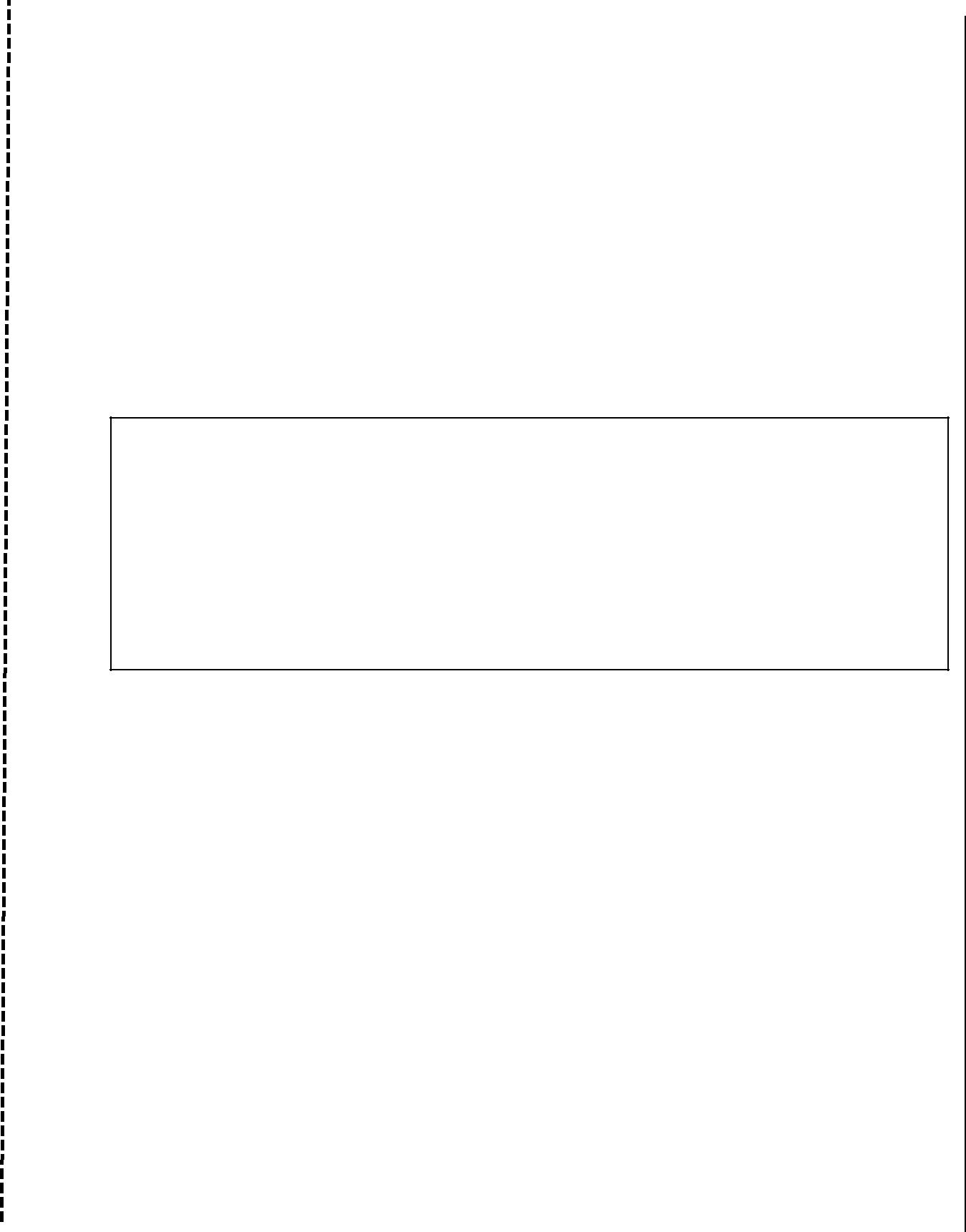
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| **\_\_\_\_\_\_\_\_\_\_学号姓名考试教室** | **公平竞争、诚实守信、严肃考纪、拒绝作弊** |
| **学院 专业班 年级** |  |

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|  |  | **重庆大学《操作系统》课程试卷** | | | | | | | | | | **A卷** |  |
|  |  | **B卷** |  |
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|  |  |  |  | **2016**—**2017 学年第一学期** | | | | | | | |  |  |
|  | **开课学院：计算机学院课程号：18012035** | | | | | | | | **考试日期：** | | |  |  |
|  | **考试方式：开卷闭卷其他** | | | | | | | | **考试时间：120 分钟** | | | |  |
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| 密 | **题号** | **一** | **二** | **三** | **四** | **五** | **六** | **七** | **八** | **九** | **十** | **总分** |  |
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|  | **得分** |  |  |  |  |  |  |  |  |  |  |  |  |
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**考试提示**

1.严禁随身携带通讯工具等电子设备参加考试；

2.**考试作弊，留校察看，毕业当年不授学位；请人代考、替他人考试、两次及以上作弊等，属严重作弊，开除学籍。**

* **Part I:True / False Questions（12 points）**
  1. ( ) The OS is a kind of application program, it manages all hardware resources to work together.
  2. ( ) A relocation register is used to check for invalid memory addresses generated by a CPU.
  3. ( ) Monitors are a theoretical concept and are not practiced in modern programming languages.
  4. ( ) When a user-level thread is created, it cannot be scheduled directly by
* kernel because the kernel can’t realize it .
  1. ( ) Most SMP systems try to avoid migration of processes from one processor to another and attempt to keep a process running on the same processor. This is known as processor affinity.
  2. ( ) Record semaphore may cause the problem of busy waiting.
  3. ( ) A deadlocked state is an unsafe state, all unsafe states are deadlocks.

1. ( ) In segmentation memory management, to access an operand needs access memory twice.
2. ( ) The system thrashing occurs lots of page-faults. It can result in severe performance problems.
3. ( ) All files in a single-level directory must have unique names.
4. ( ) When continuously reading data on the same cylinder and different disk surface, It is not necessary to move the heads.
5. ( ) Users can use the computer hardware features without going through the operating system.

**Part II: Single Choice (22 points)**

1、Which one of the following descriptions about command-interpreter (命令解释程序) is correct?（ ）

A. the interface between the user and the OS B. allows users to directly enter commands C. In the kernel or as a special program D. the program to interpret commands

2、Which of the following does not correct for memory sharing and message passing? ( )

A. Shared-memory is faster than message passing scheme because data sharing does not need to switch between kernel and user space

B. Shared-memory scheme does not need kernel support. User can do it by themselves.

C. message passing highly replies on the support of kernel.

D. message passing scheme is easy to use for users since most of its function

is provided by kernel.

3、 In five states of a process, ( ) state can convert from the other three states.

A. NEW B. RUN C. READY D. WAIT

4、A thread is a basic unit of CPU utilization, It shares with other threads belonging to the same process the ( )

A. code section B. program counter C. register set D. stack

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5、Assume 3 processes want to enter critical section, S is the mutual exclusion semaphore, the minimum value and maximum value are ( )

A. -3, 3 B.-3, 0 C.-3, 1 D.-2, 1

6、 In virtual memory, what kind of addresses is used by CPU ( ) .

A. physical address B. linear address

C. logical address D. relative address

**Part I and II Answer**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
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7、 In paging system, the size of a page is 1K bytes, if a process has a page table as right, the logical address of an instruction is 463, its corresponding physical

|  |  |  |  |
| --- | --- | --- | --- |
| address is ( | ) |  |  |
| A. 2660. | B.7583 | C.7168 | D.4559 |

|  |  |
| --- | --- |
| Page ID | Frame ID |
|  |  |
| 0 | 4 |
|  |  |
| 1 | 6 |
| 2 | 7 |
|  |  |
| 3 | 9 |
|  |  |

**Part III : Fill in the blanks（10 points）**

1. For an operating systems can be designed in different structure, including simple structure, layered,\_\_\_\_\_\_ and \_\_\_\_\_\_\_.
2. \_\_\_\_ is the important structure for a process. It includes much information about a specific process.
3. There are three types of operations can be used for semaphore,

including , \_\_\_\_\_ and \_\_\_\_\_\_.

8、In order to better use memory space, which of the following methods can be used? ( )

1. caching
2. swapping
3. SPOOLing
4. absolute loading

9、The Belady’s anomal (异常现象) probably occurs in ( ) page-replacement algorithm.

A .OPT B.FIFO C.LRU D.none

10、which of the following CPU scheduling is non-preemptive? ( )

A .FCFS B. SJF C. Priority D. round robin

11、Magnetic tapes was used as an early secondary-storage medium. The file

stored in it can be accessed in ( )

A. direct access. B. sequential access C. indexed D. none of the above

1. We can classify page-replacement algorithms into two broad categories:

\_\_\_\_\_\_\_\_\_\_allows a process to select a replacement frame from the set of all frames, \_\_\_\_\_\_\_\_\_\_\_ requires that each process select from only its own set of allocated frames.

5. The time to move disk arm to desired cylinder is called \_.

1. controller can control the device to directly access the main memory.

**Part IV: *Short* Answer Questions (32 points)**

1. Please list all types of processor scheduling in a computer and explain the main tasks for each type.

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1. Why are two modes (user and kernel) needed?

答：用户模式下可以执行的指令和访问的内存区域都受到限制。这是为了防止操作系统受到破坏或者修改。而在内核模式下则没有这些限制，从而使它能够完成其功能。

1. Please list as many as possible deadlock recovery schemes (at least 2) and explains their advantages and disadvantages.

答:(1).进程终止：

①一次只终止一个进程直到取消死锁循环为止。每次终止一个进程，都必须调用死锁检测算法以确定进程是否仍处于死锁；每次终止的进程需要一定地策略来确定终止代价最小地进程。

②终止所有进程。终止了死锁循环，但其进程地计算结果必须放弃，代价较大。

(2).资源抢占：

需要三个问题需要处理：

①如何选择一个牺牲品；

②回滚：对于被抢占资源的资源，需要对该进程做什么安排；

③饥饿：如何保证资源不会总是从同一个进程中被抢占。

1. Please explain the difference between internal and external fragmentation.

答: (1). 内部碎片就是已经被分配出去（能明确指出属于哪个进程）却不能被利用的内存空间。

内部碎片是处于（操作系统分配的用于装载某一进程的内存）区域内部或页面内部的存储块。占有这些区域或页面的进程并不使用这个存储块。而在进程占有这块存储块时，系统无法利用它。直到进程释放它，或进程结束时，系统才有可能利用这个存储块。

(2). 外部碎片指的是还没有被分配出去（不属于任何进程），但由于太小了无法分配给申请内存空间的新进程的内存空闲区域。

外部碎片是处于任何两个已分配区域或页面之间的空闲存储块。这些存储块的总和可以满足当前申请的长度要求，但是由于它们的地址不连续或其他原因，使得系统无法满足当前申请。

1. Please explain why we need to use TLB for memory accesses. What is the principle of TLB.

答:TLB，即转换表缓冲区，是小而专用且快速的硬件缓冲。

采用TLB是为了解决，由于页表存在于主存中，因此每次访问数据就需要

两次内存访问，一次用于页表条目，一次用于访问数据，而带来的内存访

问延迟。

当CPU要访问一个虚拟地址/线性地址时，CPU会首先根据虚拟地址的高20位（20是x86特定的，不

同架构有不同的值）在TLB中查找。如果是表中没有相应的表项，称为TLB miss，需要通过访问慢速

RAM中的页表计算出相应的物理地址。同时，物理地址被存放在一个TLB表项中，以后对同一线性地址

的访问，直接从TLB表项中获取物理地址即可，称为TLB hit。

1. Please explain the role of file directory and the organization structures of file directory.
2. Briefly describe the steps taken to read a block of data from the disk to the memory using DMA controlled I/O.
3. Please explain what are cache and buffer. What are their difference?

答：高速缓存cache是一种高速存储区域，可以是主存或硬盘等其他独立存储区域的一部分。缓冲区buffer主要存在于RAM中，作为CPU暂时存储数据的区域。

(1).Cache是高速存储区域，而Buffer是RAM的临时存储的正常存储区域。

(2). Cache是由静态RAM构成的，它比Buffer较慢的动态RAM更快。

(3). Buffer主要用于输入/输出过程，而Cache则用于从磁盘读取和写入进程。

(4). Cache也可以是磁盘的一部分，而Buffer只是RAM的一部分。

(5). 在Cache不能使用的情况下，可以在键盘中使用Buffer来编辑打字错误

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**Part V: Integrated Exercises (24 points)**

1. The OS allocated 4 page frames to each active process. Initially, no page in the main memory. If a process demand pages as follows:

3,4,5,6,1,0,2,3,6,3,2,1

Please use **OPT, LRU, and CLOCK** policies separately to replace the page in memory, and calculate the total page fault.

1. Consider the following snapshot of a system with five processes (p1, ... p5) and four resources (r1, ... r4). There are no current outstanding queued unsatisfied requests.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Processes | Allocation | |  |  | Max |  |  |  | Available | |  |  |
|  | R1 | R2 | R3 | R4 | R1 | R2 | R3 | R4 | R1 | R2 | R3 | R4 |
| P1 | 0 | 0 | 1 | 2 | 0 | 0 | 1 | 2 | 2 | 1 | 0 | 0 |
| P2 | 2 | 0 | 0 | 0 | 2 | 7 | 5 | 0 |  |  |  |  |
| P3 | 0 | 0 | 3 | 4 | 6 | 6 | 5 | 6 |  |  |  |  |
| P4 | 2 | 3 | 5 | 4 | 4 | 3 | 5 | 6 |  |  |  |  |
| P5 | 0 | 3 | 3 | 2 | 0 | 6 | 5 | 2 |  |  |  |  |

1. what is the content of the matrix Need?
2. Is this system currently deadlocked, or will any process become deadlocked? Why or why not? If not, give an execution order.
3. If a request from p3 arrives for (0, 1, 0, 0), can that request be safely granted immediately? And why?

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1. Assuming there are 5000 cylinders (No.0-4999) in a disk. Read-write head is at cylinder No. 143 right now, and the previous position is No.125. The coming request queue is

86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130.

Starting from the current head position, *please list the access sequences* for the following disk-scheduling algorithms?

1. FCFS, SSTF and SCAN
2. Considering the state-of-the-art storage media, there are some storage media has no arm without seeking latency. In this case, which one of the above scheduler would be the best? Describe your reason

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