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| **重庆大学****《操作系统》课程试卷**  命题人：郭平，何静媛 组题人：石亮 审题人：石亮 命题时间：20171031 教务处制  **学院 专业 班 年级 学号 姓名 考试教室**  **公平竞争、诚实守信、严肃考纪、拒绝作弊**  封  线  密 | | | | | | | | | | | |  | |
| **2017**—**2018学年第一学期** | | | | | | | | | | | | | |
| **开课学院：计算机学院 课程号：18012035** | | | | | | | | **考试日期：20171110** | | | | | |
|  | | | | | | | | **考试时间：45分钟** | | | | | |
| **题号** | **一** | **二** | **三** | **四** | **五** | **六** | **七** | | **八** | **九** | **十** | | **总分** |
| **得分** |  |  |  |  |  |  |  | |  |  |  | |  |

**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（10\*2points）**

1. (F ) PCB is very important for process. It usually stores all data and code of a process.
2. ( T) Compared to uniprocessor, multiprocessor systems have three main advantages: increased throughput, economy of scale and increased reliability.
3. ( F) When Resource Allocation Graph contains a cycle, it will have a deadlock.
4. ( F) Interrupts may be triggered by either hardware or software.
5. ( F) The difference between a program and a process is that a program is an active entity while a process is a passive entity.
6. ( T) Mutex locks and binary semaphores are essentially the same thing.
7. ( F) The monitor can be used to control exclusive access of critical resources, but it cannot be used for complicated process synchronization.
8. ( F) The system calls provide a programming interface to the operating system, they are called API.
9. (T ) When a user-level thread is created, it can not be scheduled directly by kernel because The kernel can’t realize it.
10. (T ) It is possible to create a thread library without any kernel-level support.

**Part II: Single Choice (10\*2points)**

1. Which of the following would lead you to believe that a given system is an SMP-type system? ( A )

A. Each processor is assigned a specific task.

B. There is a master–slave relationship between the processors.

C. Each processor performs all tasks within the operating system.

D. None of the above

1. The ( C ) refers to the number of processes in memory.

A. process count B. long-term scheduler

C. degree of multiprogramming D. CPU scheduler

1. Which of the following scheduling algorithms must be nonpreemptive? ( C )

A. SJF B. RR C. FCFS D. Priority algorithms

1. A ( D ) type presents a set of programmer-defined operations that are provided mutual exclusion within it.

A. transaction B. signal C. binary D. monitor

1. ( D) which of following function is system call ()

A printk B pthread\_create C printf D wait

1. The Apple Macintosh Mac OS X system apply ( D ) to build the system.
2. simple structure B. Layered approach
3. Microkernel D. Module
4. Which one is true in the following statements about process? ( C )

A. If a process is in running state, it will be turned into ready state when it executes an I/O instruction.

B. The short-term scheduler can pick a proper task from a job pool in the disk.

C. The process control block contains many pieces of information associated with a specific process.

D. All above is not true

1. ( A ) refers to the POSIX standard(IEEE 1003.1c) defining an API for thread creation and synchronization.
2. Pthreads B. Threads C. Process D. Plib
3. ( B ) scheduling algorithm allows a process move between queues. If a process uses too much CPU time, it will be moved to a lower-priority queue.

A. round-robin B. Multilevel feedback queue

C. priority D. shortest job first

1. Assume two processes want to enter the critical section, the mutual exclusion semaphore S =-1 means: ( B )

A. no process in critical section;

B. one process is waiting to enter critical section.

C. two process in critical section;

D. no process is waiting to enter critical section.

**Part I and II Answer:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I |  |  |  |  |  |  |  |  |  |  |
| II |  |  |  |  |  |  |  |  |  |  |

**Part III: Fill in the Blank(9\*2points)**

1. Each process is represented in the operating system by a ( 进程控制块 ).
2. The number of processes completed per unit of time is called ( 吞吐量 ).
3. Most programs use ( API ) instead of direct system calls to access computer resources.
4. ( SJF ) scheduling algorithm associates with the length of the process’s next CPU burst. It is assigned to the process that has the smallest next CPU burst when CPU is available.
5. Assume 5 processes want to enter critical section, S is the mutual exclusion semaphore, its the maximum value is ( 1 ) and minimum value are ( -4 ).
6. The thread can be divided into two types: ( 内核线程) and ( 用户线程 ).
7. (虚拟机) can abstract the hardware of a single computer into several different execution environments, creating the illusion that each separate execution environment is running its own private computer.

**Part IV : *Short* Answer Questions (4\*8points)**

1. What is microkernel structure? Explain the advantage of microkernel structure.

答：微内核是指内核空间只有关键的功能，其他的功能放在内核空间之外。优点是可扩展性较好

微内核技术将所有非基本功能从内核移走，将他们实现成系统程序或用户程序，微内核通常包括基本的进程管理、内存管理级通信功能。

微内核的优势包括：1.便于扩充操作系统；2.方便各平台间的移植；3.更好的安全性和可靠性。

1. Please explain the relationship between mechanism and policy. Please list at one example to state the difference.

答：机制表示我们应该做什么，策略则表示怎么做。比如我们要解决死锁问题，那么死锁避免就是机制，银行家算法就是策略

1. Please write down a solution with no deadlock for The Dining-Philosophers Problem.

答：

方案1：使用五个信号量，奇数哲学家先拿左边筷子，偶数哲学家先拿右边筷子。伪代码如下：

semaphore chopstick[5]={1，1，1，1，1};

void philosopher(int i)

{

while(true)

{

think();

if(i%2 == 0) //偶数哲学家，先右后左。

{

wait (chopstick[ i + 1 ] mod 5) ;

wait (chopstick[ i]) ;

eat();

signal (chopstick[ i + 1 ] mod 5) ;

signal (chopstick[ i]) ;

}

Else //奇数哲学家，先左后右。

{

wait (chopstick[ i]) ;

wait (chopstick[ i + 1 ] mod 5) ;

eat();

signal (chopstick[ i]) ;

signal (chopstick[ i + 1 ] mod 5) ;

}

}

方案2：允许4个哲学家同时进餐,以保证至少有一个哲学家能够进餐:   
semaphore chopstick[5]={1，1，1，1，1};   
semaphore room=4;   
void philosopher(int i)   
{   
while(true)   
{   
think();   
wait(room); //请求进入房间进餐   
wait(chopstick[i]); //请求左手边的筷子   
wait(chopstick[(i+1)%5]); //请求右手边的筷子   
eat();   
signal(chopstick[(i+1)%5]); //释放右手边的筷子   
signal(chopstick[i]); //释放左手边的筷子   
signal(room); //退出房间释放信号量room   
}   
}

4.Please explain what is CPU scheduling and dispatcher?

答：CPU调度将进程从就绪队列选出，而dispatch则是将选择的进程加载到CPU

CPU调度是多道程序操作系统的基础。通过在进程之间切换CPU，操作系统可以提高计算机的吞吐率。

分派程序是一个模块，用来将CPU的控制交给由短期调度程序选择的进程。其功能包括：切换上下文，切换到用户模式，跳转到用户程序的合适位置，以重新启动程序。

**Part V: Integrated Exercises (1\*10points)**

1. Consider the following set of processes, with the length of the CPU-burst time given in milliseconds:

Process Burst Time Priority

P1 10 3

P2 1 1

P3 2 2

P4 3 4

P5 6 2

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all

at time 0.

1. Draw four Gantt charts illustrating the execution of these processes using

FCFS, SJF, a nonpreemptive priority (a smaller priority number implies

higher priority), and RR (quantum = 1) scheduling.

1. What is the turnaround time of each process for each of the scheduling

algorithms in part a?

1. What is the waiting time of each process for each of the scheduling

algorithms in part a?

