

2018 年春季学期操作系统原理与设计期末考试

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一、填空题 $12 * 1\% = 12\%$

- (1) Fork 3 次创建_____个进程?
- (2) 操作系统是与硬件紧密结合的程序,从这个角度来看,它是一个_____和一个_____。
- (3) 系统服务的软件接口是_____。
- (4) 进程通信的两种基本模型: _____ 和 _____ 。
- (5) _____技术允许子进程和父进程开始共享同一段内存,只有在修改时子进程才会进行数据复制。
- (6) 如果满足_____条件就可以消除竞争条件(race condition)。
- (7) 死锁的四个条件: _____, _____, _____, _____

二、概念解释题 $6 * 2\% = 12\%$

- (1) 多道程序与多任务
- (2) 线程管理方式/模型
- (3) 段错误
- (4) 缺页异常
- (5) Belady 异常
- (6)

三、简答题 $6 * 4\% = 24\%$

- (1) 操作系统提供哪些服务?
- (2) 解释系统调用、API 与操作系统的关系?
- (3) 临界区问题解决需要满足的三个条件?
- (4) 文件系统采取连续分配空间有哪些坏处?
- (5) FAT32 与 EXT2/3 目录文件有何异同?
- (6) 硬链接与软链接有何区别?

四、解答题 52%

(1) 写出 fork 之后 X 行和 Y 行输出结果 5%

```
#include <sys/types.h>
#include <stdio.h>
#include <unistd.h>

#define SIZE 5

int nums[SIZE] = {0,1,2,3,4};

int main()
{
    int i;
    pid_t pid;

    pid = fork();

    if (pid == 0) {
        for (i = 0; i < SIZE; i++) {
            nums[i] *= -i;
            printf("CHILD: %d ",nums[i]); /* LINE X */
        }
    }
    else if (pid > 0) {
        wait(NULL);
        for (i = 0; i < SIZE; i++)
            printf("PARENT: %d ",nums[i]); /* LINE Y */
    }

    return 0;
}
```

(2) 根据先到先服务、最近优先、SCAN 算法计算 9%

Suppose that a disk drive has 5,000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 2150, and the previous request was at cylinder 1805. The queue of pending requests, in FIFO order, is: 2069, 1212, 2296, 2800, 544, 1618, 356, 1523, 4965, and 3681. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms?

- a. FCFS
- b. SSTF
- c. SCAN

(3) 阐述如何从根目录访问\os\files 目录，假设所有 iNode 均未被缓存。

(4) 计算使读取平均时间达到 200ns 的最大缺页率

Assume we have a demand-paged memory. It takes 8 milliseconds to service a page fault if an empty page is available or the replaced page is not modified, and 20 milliseconds if the replaced page is modified. Memory access time is 100 nanoseconds. Assume that the page to be replaced is modified 70 percent of the time. What is the maximum acceptable page-fault rate for an effective access time of no more than 200 nanoseconds?

在此基础上，增加一个条件：TLB 命中率 50%

(5) 设计读者优先的读者写者问题（第二类读者写者问题）的解决方案