上 海 交 通 大 学 试 卷（ A 卷）

（ 2020 至 2021 学年 第 2 学期 ）

班级号____________________ 学号____________ 姓名 __________

课程名称 计算机系统基础（系统软件） 成绩 __________

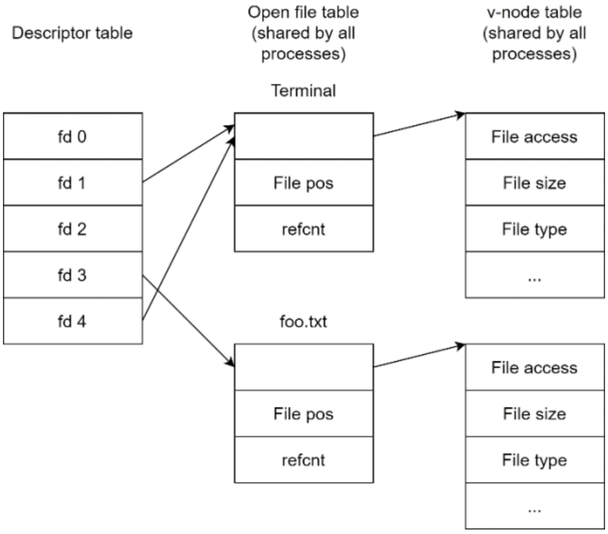
Problem 1: IO

1. fd1 is 3; fd2 is 4

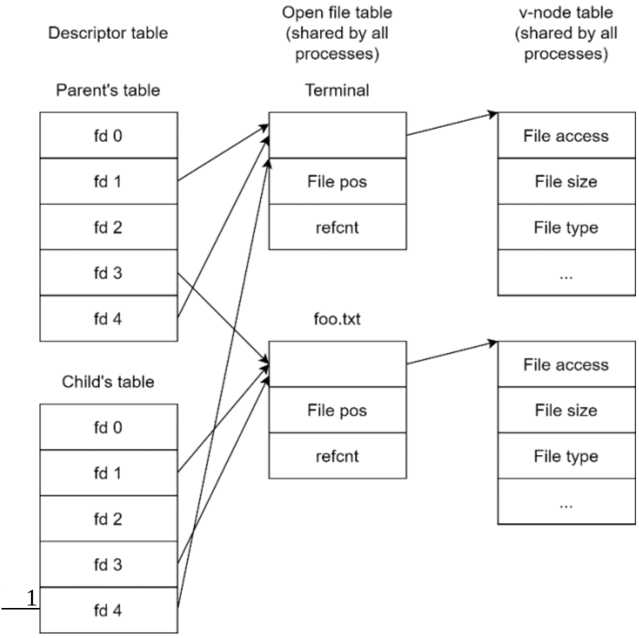
2. [1] 5 [2] 4bc456789

[3] 56 [4] 4bc456789

3.



4.



我承诺，我将严格遵守考试纪律。

题号	1	2	3	4	5				
得分									
批阅人(流水阅卷教师签名处)									

Problem 2: Process and Signal

1. 3

2. Yes. The first argument of waitpid() at Line 22 is '-1', so the value returned by waitpid() at Line 22 is greater than 0 until all child processes are reaped.

(Note: "Signal()" at Line 11 is used to register signal handler, its definition is shown at Figure 8.38 in textbook. The "SA_RESTART" flag is always set by default. So if SIGUSER1 arrives when parent process performs "waitpid()" syscall at Line 22, the "waitpid()" will be restarted automically after parent process handled SIGUSER1)

3. [1] 4　　[2] 14　　[3] 24　　[4] 41

[5] 42　　[6] 43　　[7] 33

4. while (waitpid(pid[child_exit_num], &status, 0) > 0)

5. maximum value is 3, minimum value is 1.

For sig_user1_cnt = 3, the next SIGUER1 signal arrives after parent process handled the previous SIGUSR1 by invoking handle_siguser1().

For sig_user1_cnt = 1, all SIGUSER1 signals are sent to parent process, then parent process invokes handle_siguser1() at once.

Problem 3: Network

1. No, a valid URL is not allowed to contain whitespaces. Replace the whitespace with '%20' (Or remove the whitespaces)

2. labgrade.cgi; student_id=100␣&lab=9 (Or student_id=100&lab=9 if you remore the white space in your previous answer)

3. [1] setenv("REMOTE_HOST", host, 1);

   [3] getenv("REMOTE_HOST");

4. [2] Dup2(fd, stdout); Dup2(fd, stderr);

Problem 4: Schedule

1. [1] 4　　[2] 4.5 or 4 (any is ok)　　[3] 4

   [4] 4　　[5] 0.75　　[6] 0 or 0.75

   [7] 0.75 or 0.25　　[8] 0.25 or 0.75　　[9] C

   [10] C　　[11] C　　[12] C

PS: Consider the following table for your reference:

Time(ms)	0	1	2	3	4	5	6	7	8	9	10	11	12
FIFO	A	A	A	A	B	B	C	C	C	D	D	D	D
SJF(non-preemptive)	A	A	A	A	B	B	C	C	C	D	D	D	D
SJF(preemptive)	A	A	B	B	A	C	C	C	A	D	D	D	D
STCF	A	A	A	A	B	B	C	C	C	D	D	D	D
RR	A	A	B	B	A	A	C	C	C	D	D	D	D

2. [1] B　　[2] A　　[3] B　　[4] C

   [5] C　　[6] D　　[7] D　　[8] D

3. Average turnaround time:　　4.5

Average response time: 0

4. E.g., Compared to FIFO, it is able to achieve lower turnaround time without a priori knowledge of job length; More friendly to short jobs, etc. (Any reasonable answer is ok)

Problem 5: Lock

1. [1]0

   [2]1

2. No. It is possible for a thread to enter while loop early but get lock late.

3. a) lock->flag : 0x80000000

   b) lock->flag : 0x5

4. [3]lock->flag = 0;

   [4]-1

5. Since a writer must wait until all readers their critical section, if new readers lock continuously before the old readers unlock, the writer will starve.

6. Let writer turn the most significant bit to 1 if the previous writer unlock and wait for current readers to unlock like before instead of waiting for all readers to unlock.

```
// we only need to change write_lock
void write_lock(lock_t *lock) {
    int tmp;
    while(true) {
        tmp = lock->flag;
        // try to grab write lock
        if (tmp >= 0 &&
                CAS(&lock->flag, tmp, tmp | 0x80000000) ==
tmp
                ) {
            // wait until current readers quit
            While (lock->flag & 0x7fffffff > 0);
            return;
        }
    }
}
```