// a tab is displayed as 4 spaces in answer to question 8

1.1.3 Controlling device level I/O, which is usually slow, takes up much CPU time and context switching, thus reducing efficiency.

2.1.7 (a) Disable all interrupts: will inhibit other programs to use I/O devices

(c) Set the time-of-day clock: manipulating by user programs can cause other programs to malfunction

(d) Change the memory map: will distort data currently in memory

3.1.13 A trap instruction calls a system procedure in kernel mode to dispatch to a specific system call handler and will return to where it is being called after the kernel procedure completes. It provides an interface between user mode programs and kernel-protected hardware operation or resource management.

4.1.18 fork: insufficient memory

exec: bad command, incorrect parameter, or insufficient memory

unlink: non-existing file name or i-number

5.1.25 He/she doesn’t have to know if the induced actions will not interfere with other user-groups or programs or I/O devices. But if the calls may induce any conflict, then he/she has to look inside the system call to discover where the problem was initiated.

6. a. Disk I/O, CPU time

b. Network I/O

c. Power consumption, memory

7.

#include <stdio.h>

void backtrace (void){

unsigned long long rbp;

asm volatile("movq %%rbp,%0" : "=r" (rbp));

printf("Stack backtrace:\n");

while (rbp != 0){

printf("rbp %llu\n", rbp);

rbp = \* ((unsigned long long \*) rbp);

}

}

// dummy and main are to illustrate and test

void dummy (void){

backtrace();

}

int main(void){

dummy();

return 0;

}

8. kill,wakeup1

-------------------SLEEPING

| ^

| |sleep

allocproc userinit v scheduler |

UNUSED <========> EMBRYO --------> RUNNABLE <========> RUNNING

^ fork fork ^ yield |

| |exit |exit

| wait | v

-----------------------------------------===================ZOMBIE