

Solution 5

Problem 1

Describe four classes of exceptions, and show some examples respectively.

A. Interrupts occur asynchronously as a result of signals from I/O devices that are external to the processor.

Example: type characters from keyboard, click from mouse...

B. Traps are intentional exceptions that occur as a result of executing an instruction.

Example: system calls.

C. Faults result from error conditions that a handler might be able to correct.

Example: page fault.

D. Aborts result from unrecoverable fatal errors, typically hardware errors.

Example: Such as parity errors that occur when DRAM or SRAM bits are corrupted.

Problem 2

Consider the following program:

```
#include "csapp.h"

int x =4;
int main(){
    if (Fork() == 0)
        printf("printf1: x = %d\n", ++x);
    else
        printf("printf2: x = %d\n", --x);
    exit(0);
}
```

Please write down the output of both child and parent process respectively.

Parent: printf2: x = 3

Child: printf1: x = 5

Problem 3

What are the three states of a process? And how does a state change to a different one?

Running, Stopped and Terminated.

A running process becomes stopped by receiving a signal such as SIGSTOP, SIGTSTP, SIGTTIN, or SIGTTOU.

A stopped process becomes running by receiving a SIGCONT signal.

A process becomes terminated by:

1. Receiving a signal whose default action is to terminate the process.
2. Returning from the main routine.
3. Calling the exit function.

Problem 4

Consider the following program:

```
#include "csapp.h"
```

```
int main(){
    int status;
    pid_t pid;
    printf("Hello\n");
    pid = Fork();
    printf("%d\n", !pid);
    if(pid != 0) {
        if (waitpid(-1, &status, 0) > 0) {
            if (WIFEXITED(status) != 0)
                printf("%d\n", WEXITSTATUS(status));
        }
    }
    printf("Bye\n");
    exit(42);
}
```

- A. How many output lines does this program generate?
- B. What is one possible ordering of these output lines?

- A. Six
B. Hello
0
1
Bye
42
Bye