Name: _____

Due Date: Tuesday, April 7, 2015, 23:59   **Student-Number:** _____

Submission: in paper form.
                   There is a drop off box in class and inside the CSAP Lab in
                   building 301, room 419.

Question 1
Signal Handling Issues

What is one possible output of the following program? Show the flow-chart of this program, too.

```
pid_d pid;
int counter = 1;

void handler1(int sig) {
    counter = 5;
    printf("%d", counter);
    fflush(stdout);
    exit(0);
}

int main() {
    signal(SIGUSR1, handler1);

    printf("%d", counter);
    fflush(stdout);

    if ((pid = fork()) == 0) {
        while(1) {};
    }
    kill(pid, SIGUSR1);
    waitpid(-1, NULL, 0);
    counter = counter + 1;
    printf("%d%d", counter, counter);
    exit(0);
}
```
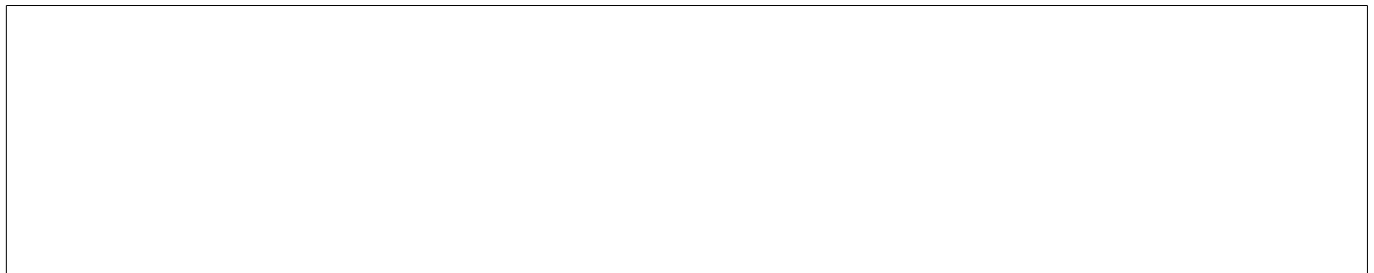
The output is _____.

< Flow Chart >

Question 2
Classes of exceptions

There are four classes of exceptions, with different causes, return behavior and synchronicity. Fill in the missing information in the following table.

Class	Cause	Sync/Async	Return to
			never return
			return to next instruction
			might return to current instruction
		Async	

Question 3
Exception handling

User programs run in user mode. Typically, devices such as the disk cannot be accessed directly in user mode. A user program invokes a system call to have the operating system perform the low-level work.

(a) Which exception mechanism is used for system calls?

(b) On Linux/IA32 systems, which instruction is used to signal a system call?

(c) How are parameters passed when invoking a system call?

Question 4

Process Scheduling Algorithms

The following is a table which informs a few things for each processes.

Process	Arrival Time	Burst Time	Priority
P1	0	6	2
P2	2	4	1
P3	5	5	3
P4	6	3	4

Then, draw the *Gantt Chart* and calculate an *average waiting time, average turn-around time, throughput* for each scheduling algorithms.

(a) **First-Come, First-Served (FCFS)**

(b) **Shortest-Job-First (SJF)**

(c) **Shortest-Remaining-Time-First (SRTF)**

(d) **Priority Scheduling**

(e) **Round Robin (RR) with Time Quantum = 3**