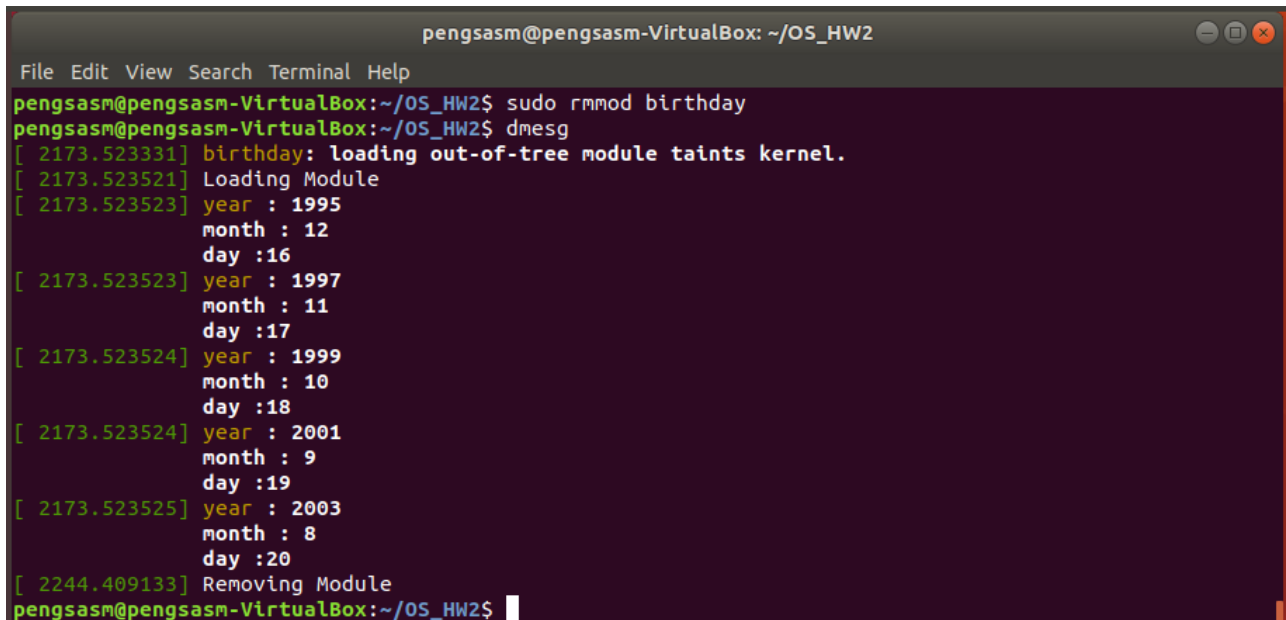**Operating Systems**
Fall 2018
Hw No. 2

(Due on Oct. 11)

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1. Read the programming project in the textbook p. 94 – p. 98, Part II. Report the screen shot of the result of 'dmesg' of the two cases. (50)
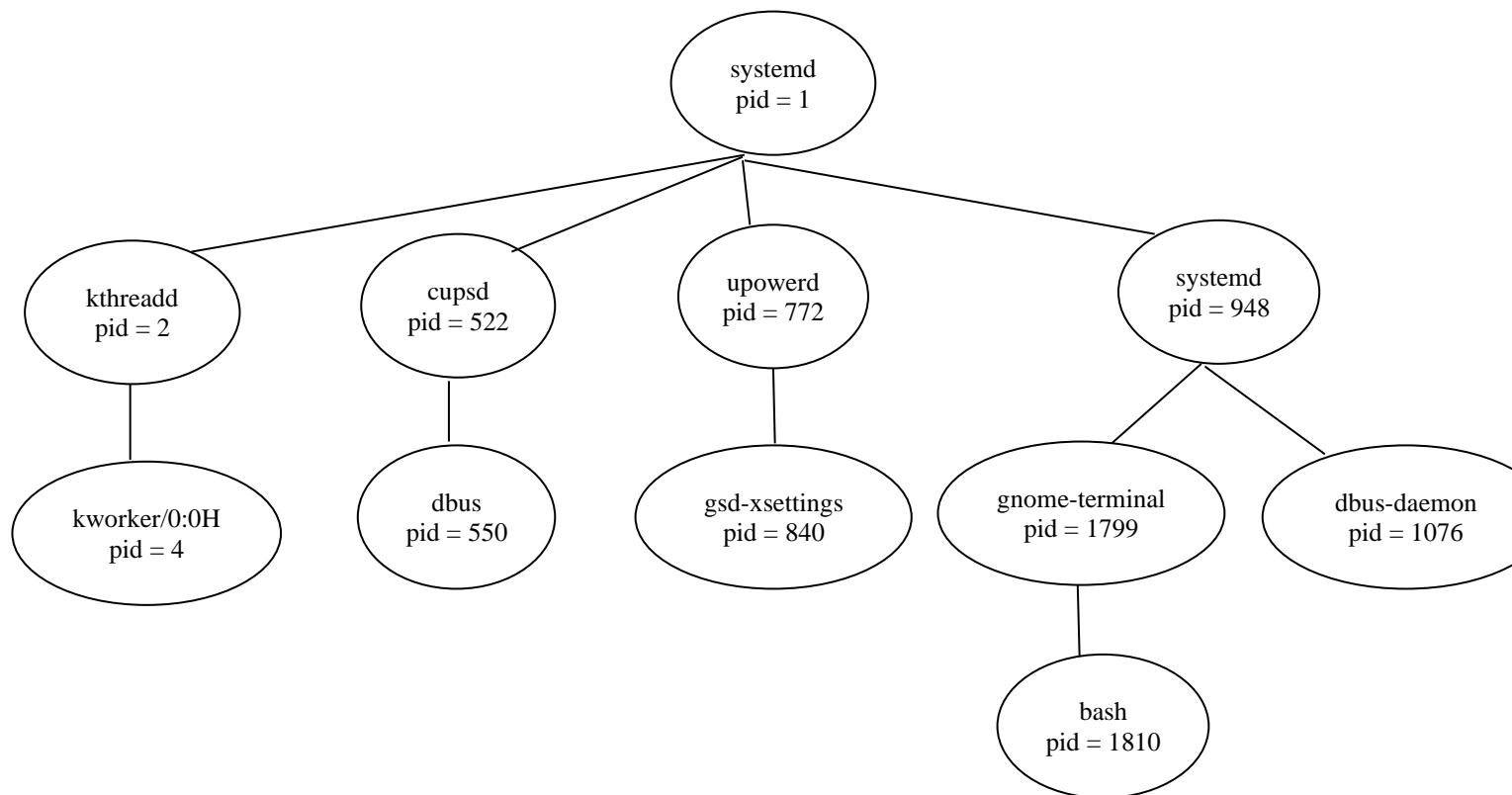
```
                    pengsasm@pengsasm-VirtualBox: ~/OS_HW2

File  Edit  View  Search  Terminal  Help
pengsasm@pengsasm-VirtualBox:~/OS_HW2$ sudo rmmod birthday
pengsasm@pengsasm-VirtualBox:~/OS_HW2$ dmesg
[ 2173.523331] birthday: loading out-of-tree module taints kernel.
[ 2173.523521] Loading Module
[ 2173.523523] year : 1995
               month : 12
               day :16
[ 2173.523523] year : 1997
               month : 11
               day :17
[ 2173.523524] year : 1999
               month : 10
               day :18
[ 2173.523524] year : 2001
               month : 9
               day :19
[ 2173.523525] year : 2003
               month : 8
               day :20
[ 2244.409133] Removing Module
pengsasm@pengsasm-VirtualBox:~/OS_HW2$
```

- After inserting the module

```
                         pengsasm@pengsasm-VirtualBox: ~/OS_HW2
 File  Edit  View  Search  Terminal  Help
pengsasm@pengsasm-VirtualBox:~/OS_HW2$ sudo insmod birthday.ko
pengsasm@pengsasm-VirtualBox:~/OS_HW2$ dmesg
[ 2173.523331] birthday: loading out-of-tree module taints kernel.
[ 2173.523521] Loading Module
[ 2173.523523] year : 1995
               month : 12
               day :16
[ 2173.523523] year : 1997
               month : 11
               day :17
[ 2173.523524] year : 1999
               month : 10
               day :18
[ 2173.523524] year : 2001
               month : 9
               day :19
[ 2173.523525] year : 2003
               month : 8
               day :20
pengsasm@pengsasm-VirtualBox:~/OS_HW2$
```

- After deleting the module

2. Textbook exercise 3.3 (p. 148). (15)

3. Textbook exercise 3.5 (p. 149). Answer the problem by executing the code of Figure 3.31. Use the command ps –ael to show the information of the process. (15)


```
pengsasm@pengsasm-VirtualBox: ~/OS_HW2
File Edit View Search Terminal Help
pengsasm@pengsasm-VirtualBox:~/OS_HW2$ gcc -o zombie HW2_zombie.c
pengsasm@pengsasm-VirtualBox:~/OS_HW2$ ./zombie
Killed
pengsasm@pengsasm-VirtualBox:~/OS_HW2$ vi HW2_fork.c
pengsasm@pengsasm-VirtualBox:~/OS_HW2$ gcc -o fork HW2_fork.c
pengsasm@pengsasm-VirtualBox:~/OS_HW2$ ./fork
pengsasm@pengsasm-VirtualBox:~/OS_HW2$
```

```
pengsasm@pengsasm-VirtualBox: ~
File Edit View Search Terminal Help
0 S  1000  1489   976  0  80   0 - 148199 poll_s tty2     00:00:00 update-notif
0 S  1000  1522   976  0  80   0 - 215657 poll_s tty2     00:00:00 deja-dup-mon
1 I     0  1650     2  0  80   0 -      0 -  ?            00:00:00 kworker/u2:1
0 S  1000  1667   948  0  80   0 - 216905 poll_s ?        00:00:02 gnome-termin
0 S  1000  1678  1667  0  80   0 -   7712 wait   pts/0    00:00:00 bash
0 S  1000  1695  1667  0  80   0 -   7712 wait   pts/1    00:00:00 bash
0 S  1000  1727  1695  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1728  1727  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1729  1727  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1730  1727  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1731  1727  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1732  1730  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1733  1729  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1734  1729  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1735  1728  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1736  1728  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1737  1728  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1738  1733  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1739  1736  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1740  1735  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1741  1735  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
1 S  1000  1742  1740  0  80   0 -   1094 hrtime pts/1    00:00:00 fork
0 R  1000  1743  1678  0  80   0 -   9326 -      pts/0    00:00:00 ps
pengsasm@pengsasm-VirtualBox:~$
```

- 16 forks are invoked

If each fork function is invoked, then it creates the child process. That means the number of the processes are doubled. Since there are 4 fork function call, the total number of the processes are 2 * 2 * 2 * 2 = 16
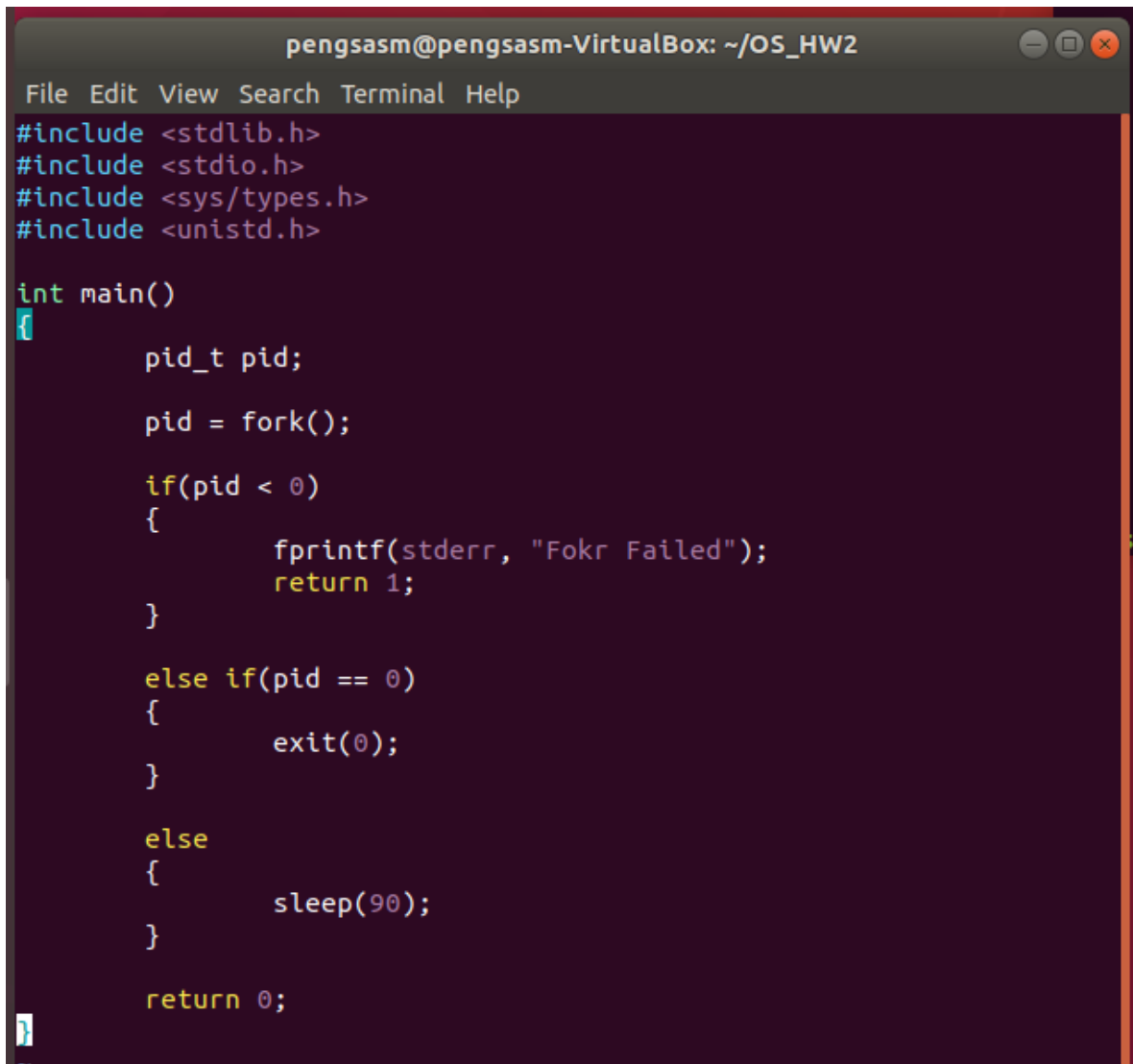
4. Textbook exercise 3.6 (p. 149). (20)

If the execlp is called, address space of the process is replaced by the parameter in execlp; in here, "PATH/bin/ls" will be the location. And this function does not return unless the errors are occurred. So, if child process is run normally, then "Line J" is never printed. It is only printed when the error occurs in child process; more explicitly, in execlp

5. Textbook exercise 3.7 (p. 149). (20)

A: It is the return value of fork for child process; it is zero

B: It is the pid number of child process

C: It is the return value of fork for parent process; it is the pid of child process

D: It is the pid number of parent process

A: 0

B: 2603

C: 2603

D: 2600

6. Textbook exercise 3.12 (p. 151). (30)

File Edit View Search Terminal Help

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

int main()
{
        pid_t pid;

        pid = fork();

        if(pid < 0)
        {
                fprintf(stderr, "Fokr Failed");
                return 1;
        }

        else if(pid == 0)
        {
                exit(0);
        }

        else
        {
                sleep(90);
        }

        return 0;
}
~
```

- Source code

4

- Zombie process is made

- Kill the zombie process by terminating parent process

- After killing it