

# SOFT400227: Operating System 2022-Fall

## Homework-3 Solutions

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**Honor Code:** I promise that I finished the homework solutions on my own without copying other people's work.

### Thread

#### 1. Differences between user-level thread and kernel level thread

	User-level Thread	Kernel-level Thread
supported by	a set of library calls in <b>user level</b>	<b>kernel</b>
time slice allocation	allocate time slice to process Each thread allocates time slices equally	<b>each thread with 1 time slice</b>
scheduler	without support of OS	like process
other		unit of CPU scheduling

#### 2. Which components are shared across threads?

- a. Register values
- b. Heap memory
- c. Global variables
- d. Stack memory

Answer: **b.** Heap memory, **c.** Global variables

#### 3. Output from the program at LINE C and LINE P?

```
1 int value=0;
2 void *runner(void *param); /* the thread */
3
4 int main()
5 {
6 int pid;
7 pthread_t tid;
```

```

8 pthread_attr_t attr;
9 pid=fork();
10 if(pid==0){
11     pthread_attr_init(&attr);
12     pthread_create(&tid, &attr, runner, NULL);
13     pthread_join(tid, NULL);
14     printf("CHILD: value=%d\n", value); /* LINE C */
15 }else if(pid > 0){
16     wait(NULL);
17     printf("PARENT: value=%d\n",value); /* LINE P */
18 }
19 }
20
21 void *runner(void *param){
22     value=5;
23     pthread_exit(0);
24 }

```

#### Output:

```

1 CHILD: value=5 // LINE C
2 PARENT: value=0 // LINE P

```

#### 4. Advantages and Disadvantages of three Multithreading Models.

Thread Model (user to kernel)	Advantages	Disadvantages
Many-to-One		1.entire process blocked by a thread 2.not real concurrency (a thread at kernel at the same time)
One-to-One	allow another thread to run when one blocked.	When creating a user-level thread OS needs to create the corresponding kernel-level thread, which incurs extra cost, so <b>the amount of thread needs to be limited.</b>
Many-to-Many	multiplexes many user-level threads to a smaller or equal number of kernel threads <b>without limitation of amounts of threads.</b>	

## Other things

L<sup>A</sup>T<sub>E</sub>X code refer to these things and was compiled on texlive2020.

- [UCB-CS70's given homework template.](#)
- [A free website useful to edit L<sup>A</sup>T<sub>E</sub>X formula code.](#)
- [A free website helpful to generate L<sup>A</sup>T<sub>E</sub>X table.](#)

Some description refer to *Operating System Concepts 10th*, [Wikipedia](#) and Professor.Tian's PPT.

The purpose of writing in English is to adapt to bilingual teaching and to improve my poor English writing skills in preparation for a possible future exchange program.

**Sorry for ugly table in Problem 4, I've tried my best :(.**

Thanks for your correcting and grading :).