National University of Computer & Emerging Sciences, Karachi

Spring 2022 CS-Department

Quiz:2

8th April 2022,

Course Code: CS2006	Course Name: Operating Systems
Instructor Name / Names: Mubashra Fayyaz	
Student Roll No:	Section:

Instructions:

- Read the question completely before answering it.
- Write starting and finishing time in above section

Time: 40 minutes. **Max Marks: 20**

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1. **The single benefit of a thread pool is to control the number of threads. [1]**
   a. **True**
   b. **False**
2. **A _____ uses an existing thread — rather than creating a new one — to complete a task.[1]**
   a. **Lightweight process**
   b. **Asynchronous procedure call**
   c. **Thread pool**
   d. **None of the above**
3. **A thread is composed of a thread ID, program counter, register set, and heap.[1]**
   a. **True**
   b. **False**
4. **When a child process is created, which of the following is a possibility in terms of the execution or address space of the child process?[1]**
   a. **The child is a duplicate of the parent.**
   b. **The child process has a new program loaded into it**
   c. **The child process runs concurrently with the parent.**
   d. **All of the above**
5. **Consider the following code segment:How many unique processes and threads are created?[3]**

```
pid t pid;
pid = fork();
if (pid == 0) { /* child process
/*
fork();
thread create( . . .);
}fork();
```

5 unique processes (p1, p2, p3, p4, p5) will be created. If the parent process is also considered, then 6 unique processes (p, p1, p2, p3, p4, p1, p5) will be created.

2 unique threads will be created.

Detail answer:

The statement pid = fork(); before the if statement creates one process. The parent process say p creates this process. Let it be p1.

The statement fork(); in the if statement creates one process. The parent process p creates this process. Let it be p2.

After the if statement, parent process p, process p1 and process p2 will execute fork(); creating three new processes.

One process is created by parent process p.
One process is created by process p1.
One process is created by process p2.
Hence, 5 unique processes (p1, p2, p3, p4, p5) will be created. If the parent process is also considered, then 6 unique processes (p, p1, p2, p3, p4, p1, p5) will be created.

Thread creation is done in if block. Only child process p1 is executed in the if block. Therefore, process p1 will be created one thread.

In the if block one process p2 is created using fork(). Therefore, process p2 will also create a thread.

Hence, 2 unique threads will be created.

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6. **Determine if the following problems exhibit task or data parallelism:[3]**
   a. **The multithreaded sorting program: Data**
   b. **The multithreaded statistical program: Data**
   c. **The multithreaded web server: Task**
7. **What is a thread-join operation? [5]**
   A thread-join operation allows a thread to wait for another thread to finish. It puts the calling thread to sleep and wakes when the target thread exits.
8. **True or False: When designing a multithreaded application, you must use synchronization primitives to make sure that the threads do not overwrite each other's registers. Explain. [5]**
   FALSE. The thread scheduler is responsible for making sure that each thread has its own set of register values (stored in the TLB). A TLB is never shared between threads.