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| **Operating Systems Lab (CL2006)** |
| Date: 07/05/2024 |
| **Course Instructor(s)** |
| Muhammad Monis |

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| **Lab Mid Exam (A)** |
| **Total Time: 60 minutes** |
| **Total Marks: 20** |
| **Total Questions**: **01** |
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| **Semester:** SP-2024 |
| **Campus:** Karachi |
| **Dept:** Computer Science |

**Submission Instructions:**

* You are given a separate sheet to solve the question no 1.
* Avoid overwriting on the paper
* All parts of Q1 must be attempted in order with question numbers mentioned.

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***CLO # 1|2: Understand and Analyze Command Line tools for Linux OS and Shell scripts for system level programming to automate tasks such as file management, system backups and software installations. Note you have do this on the paper (Total Time for this question 1 hr.)***

**Q1**. [= 20 marks]

1. Write a shell script which captures the number of processes active and created a folder under that name. i.e. Number of process active = 30, folder name = monis30.
2. Write a C/C++ program that take command line arguments, the program is supposed to create a new C/C++ file using commands (think of Mid term where we used the scripts to create and write into a file) where that program creates a new folder. The first file argument would be the folder name which would be passed to the new folder. Hint: You can use scripts as well for this or just write the C code.

| Process | Arrival Time | Burst Time | Priority | I/O Burst Time |
| --- | --- | --- | --- | --- |
| P1 | 0 | 5 | 3 | 3 |
| P2 | 1 | 3 | 1 | 2 |
| P3 | 2 | 6 | 2 | 4 |
| P4 | 3 | 4 | 4 | 2 |

1. The above contains the necessary information required to schedule, solve using the appropriate scheduling algorithms that first schedule based on priority then on I/O burst Time (note this must be small). Calculate the average waiting time for both algorithms. Also mentioned which algorithm you utilized.
2. Create a Make file which takes Folder name as arguments and passes it to the original file you write in part 2 of the question. Make sure to compile it and execute it via the make file.
3. How would you execute the SIGUSR1 and SIGUSR2 commands also write the signal whenever a child process is made.

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**Submission Instructions:**

● Name the file for each question according to Roll\_No e.g. **k22-xxxx\_Q1.c, k22- xxxx \_Q2.c** etc.

● Create a ZIP folder of all your solutions and copy it in the local storage with the title **K22-xxxx\_A** (Your paper Type).

● Submission are on local storage that can be accessed via the other location tab in explorer and then entering the address as **smb://172.16.5.43/** address in the dialog box.

● Enter your username as **khifast/K22xxxx** and its assigned password (**Default is Fast1234**).

● Zip folder needs to be pasted in the “**Exam Folder2024\teacherName\Your\_Roll\_No”** folder

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***CLO # 3: Gain hands on experience in writing code that interacts with operating system services related process and files system, multi-thread programing and different synchronization primitives.***

**Q2(a). [15 marks]** Consider yourself in a situation where you are managing an event your job is to manage the teams working hard on making sure the event is up and running. The teams are as follows, Team A is responsible for food for the Guests, Team B is responsible for managing and showing the positions for the sponsors, Team C is responsible for handling the competitions, Team D is responsible for distribution of essential items (consider water bottles for the guests). Now there are three places. The marquee, the CS Lab, and the cafeteria. All teams should work independently as threads, but the guests can move from one place to another. Enough of this scenario write a Pthread based application that ensures whenever the guest goes into any thread (place) that team is notified so extra preparation can be made to accommodate them.   
Note one case is the food not all teams should be at the food table so make sure they are synchronized and managed one by one  
Order = Team A, Team C, Team B.

**Q2(b)**. **[15 marks]** Imagine a drag racing event where multiple race cars and drivers are participating. Each car has its driver who wants to ensure a fair start to the race. However, due to the nature of drag racing, it's crucial that all cars start simultaneously once the signal is given. Here is what you are required to do, in a drag race, there are four cars lined up at the starting line, each with its designated driver. The race officials want to ensure that all cars start at the same time when the green light is signaled. How can you use semaphores to coordinate the start of the race ?

Some hints:

1. Each car driver, upon arriving at the starting line, waits for the race official to give the signal to start the race.
2. The race official holds a semaphore, representing the traffic light, which is initially set to red, indicating that the race hasn't started yet.
3. Once all drivers are ready and in position, the race official changes the semaphore to green, signaling the start of the race.
4. At the sight of the green light, each driver releases the brake simultaneously and accelerates their car down the track.

Note: he semaphore acts as a synchronization mechanism, ensuring that all drivers start the race at precisely the same moment, thus maintaining fairness and competitiveness in the drag race.