National University of Computer and Emerging Sciences

Operating Systems Lab (CL2006)

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Course Instructor(s)

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Sessional-I Exam (A)

Total Time: 3 Hours
Total Marks: 25
Total Questions: 03

Semester: SP-2024
Campus: Karachi
Department(s):AI, CS, SE, CY

Student Name	Roll No	Section	Student Signature
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CLO # 1: 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. (Lab # 1 and Lab # 3)

Q1. [9.5 marks]

(a) Write a shell script to customize your own operating system that gives a menu to the user to do the following stuff: **(Use only while loops wherever required)**

1. Create folder(s) with name(s) to be input by user.
2. List all folders in the present working directory.
3. Count all folders in the present working directory.

Handle all possible errors.

(b) Write a shell script to manage student records. Your script should allow the user to input the following details: Student Name, Names and marks of 3 subjects using command line arguments (separated by space). Once the data is entered, display a menu with the following options:

1. Calculate Percentage.
2. Display which subject has the highest marks.
3. Sort the marks in ascending order and display the result along with subject name.
4. Save student name along with marks in a text file and view the text file.
5. Exit the program.

Upon selecting an option, your script should perform the corresponding operation and display the result. Ensure that your script handles invalid inputs gracefully and provides appropriate error messages.

CLO # 2: 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. (Lab # 4 and Lab # 6)

Q2. [9.5 marks]

(a) The Fibonacci sequence is a series of numbers where each number is the sum of the two preceding ones, usually starting with 0 and 1. For example, the Fibonacci sequence up to the 10th term is 0, 1, 1, 2, 3, 5, 8, 13, 21, 34.

Write a C program using the fork() system call that generates the Fibonacci sequence in the child process. The number of terms in the sequence will be provided from the command line. For example, if 5 is passed as a parameter on the command line, the child process will output the first 5 terms of the Fibonacci sequence: 0, 1, 1, 2, 3. Because the parent and child processes have their own copies of the data, it will be necessary for the child to output the sequence. Have the parent invoke the wait() call to wait for the child process to complete before exiting the program. Perform necessary error checking to ensure that a positive integer is passed on the command line.

(b) An echo server echoes back whatever it receives from a client through shared memory, after reversing the case of each character in the message. For example, if a client sends the server the string "Hi There", the server will print "hI tHERE".

CLO # 3: Understand how to configure and customize Linux Kernel for installations, applying patches and performance optimizations. (Lab # 2)

Q3. [6 marks]

(a) Develop a calculator program using two files: **`main.c`, `calculator.c`,**along with corresponding header files **(`calculator.h`).** The **`main.c`** file should leverage functions from **`calculator.c`** enabling basic arithmetic operations. Create a Makefile to compile the program. Ensure the Makefile includes a clean rule to remove object files and the executable. Submit the completed C files, header files and Makefile along with snapshots of the output.

(b) Linux Recompilation

The general steps to recompile the Ubuntu kernel are:

1. Installing dependencies
2. Download Kernel Sources
3. Configure Kernel (Write command for this): -

   _____

4. Compile Kernel
5. Install Modules (Write command for this):

   _____

6. Install New Kernel
7. Update GRUB Configuration (Write command for this):

   _____

8. Reboot
9. Verify