**MID TERM**

**Time: 1 hour 30 minutes**

**Total marks: 20**

**Process Explorer Game**

**Objective**

The objective of this lab exam is to test your understanding and practical knowledge of process management concepts, including fork, exec, and pipes in C++ on the Ubuntu operating system.

**Game Description:**

Process Explorer is a text-based game where you will navigate through a simulated system environment, create processes, communicate between them using pipes, and execute commands. The game will present you with various challenges related to process management, and your task is to solve these challenges using the concepts learned during the course.

**Rules:**

1. The exam will be conducted on an Ubuntu machine with a C++ compiler installed.

2. You are allowed to use the C++ programming language to implement the solutions for the challenges.

3. The game will be text-based and played in the terminal or console.

4. You can use the fork() and exec() functions for process creation and execution.

5. Pipes will be used for inter-process communication.

6. You will receive points for successfully completing each challenge.

7. Your final score will be based on the number of challenges completed correctly within the given time.

Instructions:

1. Read each challenge carefully before attempting to solve it.

2. Code your solutions in C++ using the provided Ubuntu environment.

3. Make sure to handle errors and edge cases appropriately.

4. Do not use external libraries or code snippets not covered during the course.

5. Your code should be well-commented and organized.

**Sample Challenges:**

1. Challenge: Create a Child Process

Description: Implement a dynamic process creation mechanism where the user can specify the number of child processes to create, and each child process should further spawn its own children in a hierarchical manner.

Goal: Display the process hierarchy with all the processes and their parent-child relationships. (Minimum number of processes should be 4)

2. Challenge: Execute a Command

Description: Execute a command using exec.

Goal: Execute the 'ls' command and display the list of files and directories.

3. Challenge: Parent-Child Communication

Description: Implement bidirectional communication between parent and child.

Goal: Parent sends a message to the child, and the child sends a reply back.

4. Challenge: Interprocesss Communication Puzzle

Description: Design a puzzle where multiple processes have pieces of a secret message, and they need to communicate with each other using pipes to reconstruct the full message.

Goal: Reconstruct the complete secret message by exchanging data between processes through pipes (take 3 processes and combine their secret message in main process)

**Scoring:**

Your score will be based on the number of challenges you complete successfully within the given time. Each correct solution will earn you points, and your final score will be tallied accordingly.

|  |  |
| --- | --- |
| Challenges | Points |
| Challenge 1 | 4 |
| Challenge 2 | 3 |
| Challenge 3 | 5 |
| Challenge 4 | 8 |

**Duration:**

The lab exam will have a designated time limit, and you must complete as many challenges as possible within this timeframe.

**Submission guidelines:**

* Submit zip folder along with cpp files and output screenshot of each challenge.
* Name your folder with roll-no only for example 21i-1234.

**Best of luck with the exam! Enjoy the Process Explorer game and demonstrate your expertise in process management with C++ on Ubuntu. 😊**