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Operating System Lab Mid Exam

Question:

Compute the Factorial using IPC (PIPE implementation).
1. Parent creates pipe
2. Forks a child
3. Parent writes into pipe (the number for Factorial)
4. Child reads from pipe and compute the Factorial for the number written by Parent and print them.

Solution :

- **Header Files :**

```c
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
```

- **Factorial Function :**

```c
int factorial(int n) {
    if (n <= 1) {
        return 1;
    }
    return n * factorial(n - 1);
}
```

- **Main Function :**

```c
int main() {
    int num;
    int pipefd[2];
    pid_t pid;

    if (pipe(pipefd) == -1) {
        perror("pipe");
        exit(EXIT_FAILURE);
    }
    pid = fork();
    if (pid == -1) {
        perror("fork");
        exit(EXIT_FAILURE);
    }
    if (pid == 0)
    {               // child process
        close(pipefd[1]);        // close unused write end of the pipe
        read(pipefd[0], &num, sizeof(num));  // read from pipe
        int fact = factorial(num);
        printf("Factorial of %d is %d\n", num, fact);
        close(pipefd[0]);                  // close read end of the pipe
        exit(EXIT_SUCCESS);
    }
    else
    {  // parent process
        close(pipefd[0]);  // close unused read end of the pipe
        printf("Enter a number to find its factorial: ");
        scanf("%d", &num);
        write(pipefd[1], &num, sizeof(num));  // write to pipe
        close(pipefd[1]);  // close write end of the pipe
        wait(NULL);  // wait for child to finish
        exit(EXIT_SUCCESS);
    }
}
```

- **Output of the program :**

```
saqib@saqib-VirtualBox:~/OS Mid paper$ ./a
Enter a number to find its factorial: 4
Factorial of 4 is 24
saqib@saqib-VirtualBox:~/OS Mid paper$ ./a
Enter a number to find its factorial: 8
Factorial of 8 is 40320
saqib@saqib-VirtualBox:~/OS Mid paper$ ./a
Enter a number to find its factorial: 10
Factorial of 10 is 3628800
saqib@saqib-VirtualBox:~/OS Mid paper$ ./a
Enter a number to find its factorial: 12
Factorial of 12 is 479001600
saqib@saqib-VirtualBox:~/OS Mid paper$ ./a
Enter a number to find its factorial: 1
Factorial of 1 is 1
saqib@saqib-VirtualBox:~/OS Mid paper$
```