NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES

ISLAMABAD OPERATING SYSTEMS SPRING 2020

ASSIGNMENT 01

Instructions

- Zero marks will be awarded to the students involved in plagiarism.
- All the submissions will be done on slate.
- Create separate file for each question.
- Be prepared for viva or anything else after the submission of assignment for two weeks.

QUESTION NO. 01

Write a C program on Linux platform to implement the below given process hierarchy. Each process displays its name (e.g. A,B,..), its process ID and the process ID of its parent. A process used the getpid () and getppid () system calls to obtain these IDs.

Sample output of the process is: P1: ID: = 1234, Parent ID = 1123

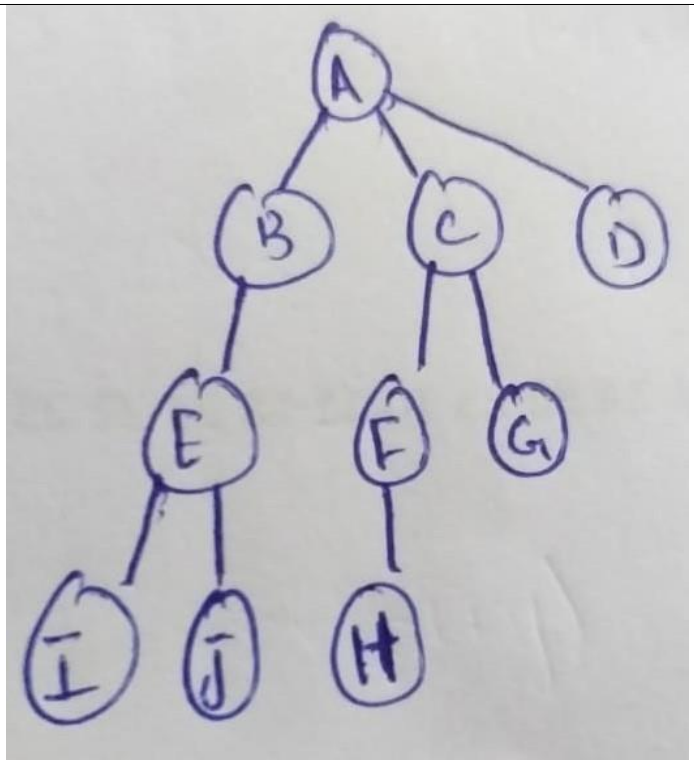


Figure 1: Hierarchy of Processes

QUESTION NO. 02

Write two different programs for Producer process P_p and worker process P_w.

P_p will take an integer value as an argument: *P_p num*

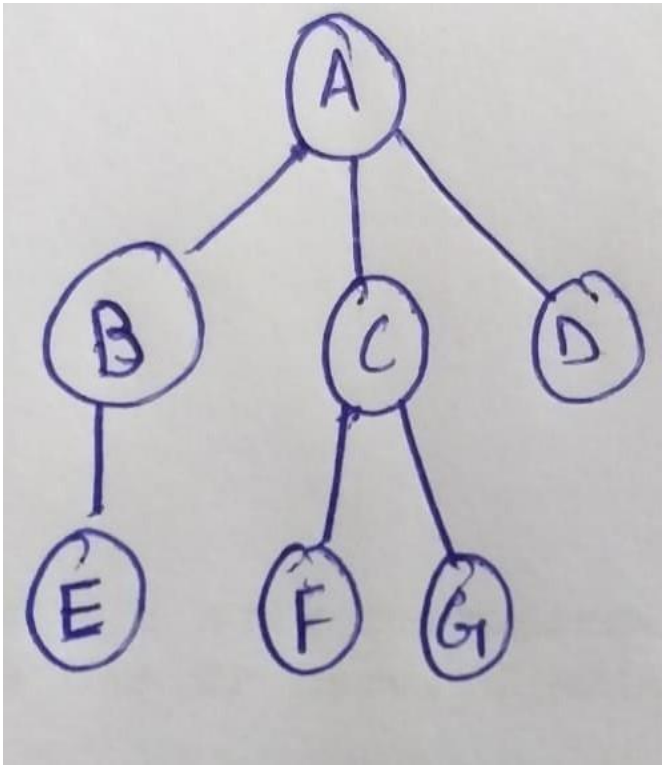
where *num* indicates the total number of P_w processes it will create. Generate an error message if *num* is not greater then equal to one and terminate the process. Otherwise in each run {1...num} P_p will take x and y as input. It will then create a child process and replace its image with a new P_w process and pass x and y to the new process as parameters. P_w now created by P_p get two variables values x and y. Calculate the output using the following expression:

$$\text{output} = \sum_{n=1}^{x} y^n$$

After displaying the value of output terminate the current P_w process.

QUESTION NO. 03

Write a C program on Linux platform to implement the below given scenario. You have to solve the following equation: output= w*(x+y) + [(w+v) + (v+x)] - (z-x);



For computing the equation,

Parent solves

Child B solves w*(x+y)

Child C solves (w+v)+(v+x)

Child D solves (z-x)

Child E solves(x+y)

Child F solves(w+v)

Child G solves(v+x)

Child B first will first wait for child E to solve its part and store it somewhere, and child B will use the calculation performed by child E. Similarly, child C will wait for F & G to solve their parts and will use its calculated terms (Hint: You need to use wait call efficiently).

Note: You need to take inputs from user in the parent process before using fork and at last, parent will sum up the equation and show output. Also your answer can be float if it's less than 1 then add one in your answer.

QUESTION NO. 04

Run the below code again and again, observe the output and explain what is happening.

```
#include<iostream>
#include<unistd.h>
using namespace std;
int main()
{
int a=5;
fork();
a++;
fork();
a++;
fork();
cout<<endl<<a;
return 0;
}
```

Hint: *Use "top" command and observe the process table. Also study about orphan and zombies processes.*

Important Note: Submit word file for this question.

QUESTION NO. 05

You need to make a program that takes 2 arrays, and sort each array using a separate process(fork). First child should sort first array and display it and after that second child sort the second array and display it.
Important: Sequence should be followed otherwise 0 marks.