# PROI Questions solved

# DU1

## DIFFERENCE BETWEEN PROGRAM AND PROCESS

Program contains a set of instructions designed to complete a specific task. Process is an instance of an executing program.

## WHAT DOES MULTI-PROCESS PROGRAMMING CONSIST OF?

Multiprocess programming allows multiple processes to run simultaneously on the same program code. When we have two processes running a certain program (e.g. Microsoft Word), we can work with different documents.

## WHO IS RESPONSIBLE FOR THE MANAGEMENT OF THE PROCESSES IN COMPUTERS?

The CPU

## WHAT IS THE ps COMMAND FOR IN GNU/LINUX?

Through the command ps (process status) of Linux you can see information associated with the current processes.

## WHAT IS THE top COMMAND FOR IN GNU/LINUX?

The top command is used to show the Linux processes. It provides a dynamic real-time view of the running system. Usually, this command shows the summary information of the system and the list of processes or threads which are currently managed by the Linux Kernel.

## WHAT IS THE free COMMAND FOR IN GNU / LINUX?

The Linux free command outputs a summary of RAM usage, including total, used, free, shared, and available memory and swap space. The command helps monitor resource usage and allows an admin to determine if there's enough room for running new programs. In this tutorial, you will learn to use the free command in Linux.

## WHAT GRAPHIC APPLICATION DO YOU KNOW IN UBUNTU TO SEE THE STATUS OF THE PROCESSES?

System monitor

## WHAT GRAPHIC APPLICATION DO YOU KNOW IN WINDOWS TO SEE THE STATUS OF THE PROCESSES?

Task manager

## WHAT IS THE MS-DOS tasklist COMMAND FOR?

The Windows tasklist command will show the running processes.

## WHAT DIFFERENT STATES DO THE PROCESSES MANAGED BY THE OPERATING SYSTEMS HAVE?

As a process evolves in its life cycle, it can change states. Each process can be in one of the following states:

⦁ New: the process is being created.

⦁ Running: the process is in the CPU executing instructions.

⦁ Waiting: process waiting for an event to occur (e.g. completion of an I/O operation or reception of a signal).

⦁ Ready: waiting to be assigned to a processor.

⦁ Terminated: its execution has ended, therefore it does not execute any more instructions and the operating system will withdraw the allocated resources.

Note: Only one process can be running on any processor at a time, although multiple processes can be ready and waiting.

## WHAT IS THE DIFFERENCE BETWEEN A PARENT AND A CHILD PROCESS?

A parent process may have multiple child processes but a child process only one parent process.

A child is a leaf in the process tree, a parent is a node.

The main process is not a child process.

Daemon child processes cannot create children processes.

## WHAT IS THE fork() FUNCTION FOR IN C?

When called, it creates a child process that is an almost exact copy of the parent process (duplicate of the parent). Both processes continue to run from the point where the fork() function was called.

On UNIX, processes are identified by a "process identifier" (PID) which is a unique integer. Both processes continue their execution in the statement that follows fork(), but with the following difference:

⦁ The code that the child process receives from fork() is zero

⦁ The code that the parent process receives from fork() is the PID of the child process

## WHAT IS THE exec() FUNCTION FOR IN C?

This function replaces the program that is running in the process with another program. When a program calls a function of type exec(), its execution immediately ceases and the new program starts running from the beginning, assuming no error occurred during the call to the exec() function.

## WHAT IS THE POSITIVE INTEGER NUMBER NAMED THAT EXCLUSIVELY IDENTIFIES EACH PROCESS IN OPERATING SYSTEMS?

The PID

## WHAT ARE LINUX PIPES FOR?

Communication between processes

## WHAT IS THE kill COMMAND FOR IN GNU/LINUX?

This function is used to send signals between processes, it is defined in the signal.h library and has the following syntax:

int kill (int Pid, int Señal);

## WHICH GNU/LINUX COMMAND CAN BE USED TO COMPILE A PROGRAM IN C LANGUAGE?

gcc programa.c -o programa

## WHAT IS A ZOMBIE PROCESS?

A zombie process is a process in its terminated state. This usually happens in a program that has parent-child functions. After a child function has finished execution, it sends an exit status to its parent function. Until the parent function receives and acknowledges the message, the child function remains in a “zombie” state, meaning it has executed but not exited.

A zombie process is also known as a defunct process.

## WHAT IS THE wait(NULL) C STATEMENT FOR AND WHERE IS IT USUALLY LOCATED WITHIN THE PROGRAMS IN C?

It blocks the process calling the function until one of its child processes terminates execution or until it receives a signal.

In addition, it returns the PID of the child process that has finished executing. One of the reasons to use this function is for a parent process to wait for one of its child processes to finish execution.

It’s usually located in the parent, as it waits for the first of his children to finish.

## WHAT IS THE exit(0) C STATEMENT FOR?

If the returned status is 0, the termination of the process has been successful.

## WHAT DO YOU GET IN C WHEN YOU RUN THE printf() STATEMENT?

The C library function int printf(const char \*format, ...) sends formatted output to stdout.

## DO YOU KNOW ANY SENTENCE IN C TO SET UP LOOPS?

While ( condition ) { }

do { ….. } while(condition);

for( …. ) { }

## WHICH C STATEMENT DO YOU KNOW TO MAKE A SELECTION OF VALUES?

if statement

## HOW ARE THE COMMENTS IN C DEFINED?

// Single line comment

/\* Multi-line comment

## WHAT IS THE pipe() C STATEMENT FOR?

To create an unnamed pipe

## WHAT IS THE Process ABSTRACT JAVA CLASS FOR?

To implement the different methods needed for processes in java

## WHAT IS THE Runtime JAVA CLASS FOR?

It represents the application's execution environment.

Java Runtime class is used to interact with java runtime environment. Java Runtime class provides methods to execute a process, invoke GC, get total and free memory etc.

## WHAT IS CONCURRENT PROGRAMMING?

Simultaneous existence of several running processes

## WHAT IS PARALLEL PROGRAMMING?

A parallel program is a type of concurrent program designed to run on a multiprocessor system. Parallel processing allows many independent process elements to work simultaneously to solve a problem. The problem to be solved is divided into independent parts, in such a way that each element can execute the part of the program that corresponds to it at the same time as the others.

## WHAT IS DISTRIBUTED PROGRAMING?

Distributed programming is a programming paradigm focused on developing distributed, open, scalable, transparent and fault-tolerant systems. This paradigm is the natural result of the use of computers and networks. Almost any programming language that has maximum access to the system hardware can handle distributed programming, considering a good amount of time and code.

# DU2

## WHAT DOES THREAD OF EXECUTION WITHIN A PROCESS MEAN?

A thread is the basic unit to which the operating system allocates processor time. A thread can execute any part of the process code, including parts currently being executed by another thread.

## DO YOU KNOW ANY SYNONYM TO CALL THE THREADS?

Light processes

## WHAT STATES DO YOU THINK A THREAD MAY HAVE?

⦁ **Creation**: in general, when a new process is created, a thread is created for that process as well. Later that thread can create new threads by giving them an instruction pointer and some arguments. That thread will be placed in the ready queue.

⦁ **Blocking**: when a thread must wait for an event, it is blocked by saving its records. This way the processor will start executing another ready thread. It goes to the block stack.

⦁ **Unblocking**: when the event that a thread was blocked occurs, it goes to the ready queue.

⦁ **Termination**: when a thread ends, its context and stacks are released.

## IS PROCESS THE SAME AS THREAD?

No, thread is the segment of a process which means a process can have multiple threads and these multiple threads are contained within a process.

## WHAT RESOURCES DO YOU THINK THE THREADS OF THE SAME PROCESS WILL SHARE?

Shared resources between threads:

⦁ Code (instructions).

⦁ Global variables.

⦁ Open files and devices.

Resources not shared between threads:

⦁ Program counter (each thread can execute a different section of code).

⦁ CPU registers.

⦁ Stack for local variables of procedures that you invoke after creating a thread.

⦁ State: running, ready or blocked.

## WHAT DO YOU THINK THE THREADS WILL BE USED FOR?

Threads can be used to perform complicated tasks in the background without interrupting the main program.

Examples:

the possibility of editing while we continue loading or saving a large file, the possibility of displaying a page while searching for the next ones, the display of several processes that occur simultaneously independently, etc.

## WHAT DO YOU THINK THE JAVA THREAD CLASS WILL BE USED FOR?

Creation and management of threads in java, being able to extend from it and override it’s methods

## WHAT IS THE DIFFERENCE IN JAVA BETWEEN CLASSES AND INTERFACES?

Like a class, an interface can have methods and variables, but the methods declared in interface are by default abstract (only method signature, no body). Interfaces specify what a class must do and not how. It is the blueprint of the class. If a class implements an interface and does not provide method bodies for all functions specified in the interface, then class must be declared abstract.

## WHAT DIFFERENCE IS THERE IN JAVA BETWEEN CLASS METHODS AND INSTANCE METHODS?

Instance methods use an instance of a class, whereas a class method can be used with just the class name.

examples:

Class method → sleep();

Instance method → p.start();

## WHAT DO YOU THINK THE SLEEP () METHOD OF THE JAVA THREAD CLASS WILL BE USED FOR?

Causes the active thread to "sleep" (stop temporarily) for the amount of time specified in milliseconds (millis).

## WHAT DO YOU THINK THE YIELD () METHOD OF THE JAVA THREAD CLASS WILL BE USED FOR?

Causes the current thread to temporarily pause and allow other threads of higher or same priority to run.

## WHAT DOES PROCESSOR AFINITY MEAN?

In computers that have CPUs with several processors or processors with several cores, the affinity of the processor allows you to assign a specific processor or core to a given program. It enables the binding and unbinding of a process or a thread to a central processing unit (CPU) or a range of CPUs, so that the process or thread will execute only on the designated CPU or CPUs rather than any CPU.

## HOW WOULD YOU CHANGE THE PROCESSOR AFFINITY IN A WINDOWS OPERATING SYSTEM?

Through the task manager, select the application to which we want to assign an affinity, click on the right button of the mouse and go to its process. If it is not an application, we can go directly to the processes tab.

## HOW DO YOU THINK THE SELFISH THREADS WILL WORK?

When a certain thread enters the Runnable state and continues its execution until it dies. During that period of time no other thread can be executed.

## DO YOU KNOW ANYTHING ABOUT THE JAVA METHODS DECLARED AS SYNCHRONIZED?

Only one thread at a time can execute a synchronized method on an object. If for whatever reason, the execution of the thread that has taken the mutex is interrupted, the step will be given to another thread that does not require the mutex on that object. Once the mutex is released by the thread that has taken it, the blocked threads waiting for it become "runnable", although only one of them will be assigned the mutex.

## WHAT DO YOU THINK WILL HAPPEN WHEN A DEADLOCK SITUATION OCCURS BETWEEN MULTIPLE THREADS?

Those threads remain waiting forever.

## DO YOU KNOW ANYTHING ABOUT THE PRODUCER-CONSUMER MODEL OF THREADS?

This model is based on the following:

⦁ A thread (the producer) generates an element that is added to a buffer.

⦁ The added element is consumed by another thread (consumer).

⦁ The buffer has limited capacity and when it is full, the producer must wait until there is space.

⦁ The consumer must wait until there are items in the buffer to be able to withdraw them.

## WHAT DO YOU THINK THE WAIT() METHOD OF THE JAVA OBJECT CLASS WILL DO?

The java.lang.Object.wait() causes current thread to wait until another thread invokes the notify() method or the notifyAll() method for this object. In other words, this method behaves exactly as if it simply performs the call wait(0).