Assignment 1 -

1 – The difference between FreeBSD and Linux kernel is that in the Linux Kernel offers only the kernel (plus some device drivers). Indeed, FreeBSD use the same kernel that Linux Kernel but add to this some faculties to become a full fledged OS.

2 – There is four main role that the OS must assume :
The precess management.
The memory management.
The file system management.
The device management.

3 – Certainly, thread and process may be use with the same target but both are very different :
A thread is a subset of a the process. Roughly said, a thread is a part of the process, and this thread has a task to give to the CPU. The process have three main parts : the code, the data and the stack. Each program have a process. For example the Booting process is the process which start the computer.

4 – A monolithic kernel is actually a code in a single C file giving rise to a single process that implements services. A micro-kernel is an “encapsulation” of a monolithic kernel. Doing basics jobs, and in contrary to the monolithic kernel, a micro kernel the device drivers are outside of the kernel.

5 – BIOS (Basic Input/Output System) is the first software to during the booting process (when we start the computer). The BIOS has two roles :
The hardware initialisation.
Provide basic hardware services to the mounted OS and the other programs upon their request.

6 – The gcc (GNU C Compiler) is a C compiler. All the persons which where in the GNU project wrote it, in particular Richard Stallman.

7 – A Linux destros is a distribution of Linux. Indeed, a Linux distros use the kernel Linux, and add all the features needed. For example, Ubuntu or Kali are some Linux distros...

8 – A micro-kernel is an encapsulation of a monolithic kernel. In a micro-kernel there is only basic functionality that may a computing device operate.

9 – A multiprogramming system there are one or more programs loaded in main memory which are ready to execute. Only one program at a time is able to get the CPU for executing its instructions while all the others are waiting their turn.

10 – The main disadvantage of a monolithic kernel is that if there is an introduction of any new unsupported hardware requires a rewrite of the kernel recompilation, an re-installing the entire OS. Adding to this, if any device crashes the entire kernel suffers as a result.

11 – List of kernel shell :
Bash, Tcsh, Ksh, Zsh, Fish.

12 – A user application can use a system call by using a C function. From here the kernel is received the task and understand the asking of the user.

13 – Debian Linux is an OS which use the Linux kernel or the FreeBSD kernel.
14 – An interrupt is a signal to the CPU alerting the CPU that a more important require need to be treated, and then the current process executed is interrupted.

15 – RAM (Random Access Memory) is a data storage that allows the reading and writing of data in almost the same time.

The RAM acts like the array data structure.

16 – The main advantage if a monolithic kernel is that there is a single address space enabling all features to communicate in the fastest way possible without resorting to any type of message passing.

17 - An address space is a range of valid addresses in memory that are available for a program or process. That is, it is the memory that a program or process can access. The memory can be either physical or virtual and is used for executing instructions and storing data.

18 – A spooling is the fact to switch the CPU attention between contending tasks.

19 – A thread, also called sequential process is one of the separation of the tasks that the process must execute. Roughly speaking, a thread is a one of the tasks that a process must do. A single process may contain many threads.

20 – The main disadvantage of a micro-kernel is that it suffers from performance decreases due to increased system function overhead. Differently said, because with the structure of a micro-kernel, it must have communication between some micro-kernel, and then, a lost of time.

21 – The difference between the GNU/Linux and the Linux Kernel is that Linux Kernel is only a kernel without any of the remaining tools required for an OS.
But GNU/Linux (or simply Linux) is an OS which actually use the Linux Kernel. And of course add the tools needed to be a good OS.

22 – A system call is a way to communicate between the user space and the kernel space. This is situate in the kernel, and not in a C library.

23 – All stages of the booting process are :
BIOS – stand for Basic Input/Output System. Searches, loads and executes the boot loader program.
MBR – (Master Boot Record) loads and executes the GRUB boot loader.
GRUB – (Grand Unified Bootloader) loads and executes kernel and initdr images.
Kernel – executes the /sbin/init program.
Init - identifies the default initlevel from /etc/inittab and uses that to load all appropriate program.

24 – The main state a process can be are : Running, Ready, Blocked.
The move is done by a process scheduling algorithm implemented in the kernel.
We refer to it as the scheduler.

25 - A device driver is a computer program that operates or controls a particular type of device that is attached to a computer.

26 – A shell is a user interface for access to the OS services. There are two type of implementation of the shell, CLI (Command Line Interface) or GUI (Graphical User Interface).

27 – The main advantage of a micro-kernel is that the security of the use. As we said above, the main disadvantage of monolithic kernel is that if Adding to this, if any device crashes the entire kernel suffers as a result. Then, this advantage is not exist anymore with the micro-kernel.

28 – The kernel threads are created and scheduled by the kernel. Kernel threads are relatively expensive to create.

29 – User application should minimize the number of system call invocation because a system call is taking a lot of time : Issuing system calls is and will always be an expensive operation is Oss.

30 – A process is a body of information with three main parts : the code, the data, and the stack. In the data we can find static data and dynamic data.

31 – A boot loader is a type of program that loads and starts the boot time tasks and processes of an operating system or the computer system. It enables loading the operating system within the computer memory when a computer is started or booted up.

32 – A clock tick is the smallest unit of time recognized by a device.

33 – The user space is composed of the application, the shell, the editors and the compiler. All of this layer are actually deserved to the user, and only the user. To comunication with the OS (actually the kernel) we use the system calls.
The kernel space is actually the OS. It should handle the process, the memory, the file system, and the device management to make the hardware functional. To do this, OS use device driver.

34 – GNU/Hurd is the multi server micro-kernel written as part of GNU project. It has been designed as a replacement for the Unix kernel.

35 – The relationship between the Linux kernel and the standard C libraries are blocked. Indeed the Linux kernel does not have access to any of the standard C libraries, and then cannot use the C library functions like printf.

36 – A thread pool is the creation of threads and assignment of tasks to these threads.
A manager maintain a pool of fixed size of threads that are assigned tasks according to their avaibility.

37 – A context switch is the act of switching between tasks on a system.

38 – A monolithic kernel is a code in a single C file giving rise to a single process that implements all of the service that we said above (the process, the memory, the file system, and the device management).

39 – Yes, an OS include a kernel but that’s not all : it’s also includes applications like the user interface…

40 – A user thread is a thread which is implemented by the user. Like a java simple thread which do a task.