Difference between multiprogramming and multiprocessing

S.No.	Multiprocessing	Multiprogramming
1.	The availability of more than one processor per system, that can execute several set of instructions in parallel is known as multiprocessing.	The concurrent application of more than one program in the main memory is known as multiprogramming.
2.	The number of CPU is more than one.	The number of CPU is one.
3.	It takes less time for job processing.	It takes more time to process the jobs.
4.	In this, more than one process can be executed at a time.	In this, one process can be executed at a time.
5.	It is economical.	It is economical.
6.	The number of users is can be one or more than one.	The number of users is one at a time.
7.	Throughput is maximum.	Throughput is less.
8.	Its efficiency is maximum.	Its efficiency is Less.

Difference between multiprogramming and Timesharing

S.No.	TIME SHARING	MULTIPROGRAMMING
01.	Time Sharing is the logical extension of multiprogramming, in this time sharing Operating system many users/processes are allocated with computer resources in respective time slots.	Multiprogramming operating system allows to execute multiple processes by monitoring their process states and switching in between processes.
02.	Processors time is shared with multiple users that's why it is called as time sharing operating system.	Processor and memory underutilization problem is resolved and multiple programs runs on CPU that's why it is called multiprogramming.
03.	In this process, two or more users can use a processor in their terminal.	In this, the process can be executed by a single processor.
04.	Time sharing OS has fixed time slice.	Multi-programming OS has no fixed time slice.
05.	In time sharing OS system, execution power is taken off before finishing of execution.	In multi-programming OS system before finishing a task the execution power is not taken off.
06.	Here the system works for the same or less time on each processes.	Here the system does not take same time to work on different processes.
07.	In time sharing OS system depends on time to switch between different processes.	In Multiprogramming OS, system depends on devices to switch between tasks such I/O interrupts etc.

Difference between multiprogramming and multitasking

Features	Multiprogramming	Multitasking
Basic	It allows multiple programs to utilize the CPU simultaneously.	A supplementary of the multiprogramming system also allows for user interaction.
Mechanism	Based on the context switching mechanism.	Based on the time-sharing mechanism.
Objective	It is useful for reducing/decreasing CPU idle time and increasing throughput as much as possible.	It is useful for running multiple processes at the same time, effectively increasing CPU and system throughput.
Execution	When one job or process completes its execution or switches to an I/O task in a multi-programmed system, the system momentarily suspends that process. It selects another process from the process scheduling pool (waiting queue) to run.	In a multiprocessing system, multiple processes can operate simultaneously by allocating the CPU for a fixed amount of time.
CPU Switching	In a multiuser environment, the CPU switches between programs/processes quickly.	In a single-user environment, the CPU switches between the processes of various programs.
Timing	It takes maximum time to execute the process.	It takes minimum time to execute the process.

Difference between Multiprogramming, multitasking, multithreading and multiprocessing

No	Characteristic	Multiprogramming	Multiprocessing	Multithreading	Multitasking
1	What it is:	The concurrent residency of more than one program in the main memory is called as multiprogramming.	The availability of more than one processor per system, which can execute several set of instructions in parallel is called as multiprocessing.	A process is divided into several different sub-processes called as threads, which has its own path of execution. This concept is called as multithreading.	The execution of more than one task simultaneously is called as multitasking.
2	Number of CPU:	One	More than one	Can be one or more than one	One
3	Job processing time:	More time is taken to process the jobs.	Less time is taken for job processing.	Moderate amount of time is taken for job processing.	Moderate amount of time.
4	Number of process being executed:	One process is executed at a time.	More than one process can be executed at a time	Various components of the same process are being executed at a time.	One by one job is being executed at a time.
5	Economical:	It is economical.	Is less economical.	Is economical.	It is economical.
6	Number of users:	One at a time.	Can be one or more than one.	Usually one.	More than one.
7	Throughput:	Throughput is less.	Throughput is maximum.	Moderate.	Throughput is moderate.
8	Efficiency:	Less	Maximum	Moderate	Moderate