What is difference between Multi-Programming, Multi-Tasking and Multi-Threading?

➢ Multi-Programming:

Multi-programming refers to the technique of running multiple programs simultaneously on a computer. In multi-programming, the computer's operating system allocates CPU time to different programs in a way that makes it appear as if they are running concurrently. However, the CPU is rapidly switching between different programs, giving each program a turn to execute its instructions. It allows for efficient CPU utilization by keeping the CPU busy with productive work even when one program is waiting for input or output operations.

➢ Multi-Tasking:

Multi-tasking is an extension of multi-programming, but with a focus on user interaction and responsiveness. In multi-tasking, the operating system allows multiple tasks or applications to run concurrently and share the CPU's time. The CPU is divided into small time slices, and each task is allocated a time slice to execute its instructions. This gives the illusion of tasks running simultaneously and provides a responsive environment for users to interact with different applications smoothly. Multi-tasking is commonly used in modern operating systems to handle multiple user interactions and run various applications concurrently.

➢ Multi-Threading:

Multi-threading is a technique used within a single program or process to achieve concurrent execution. It involves dividing the program's tasks into smaller units called threads. Threads are like independent workers within the program that can execute different parts of the program's instructions simultaneously. These threads share the same memory space and resources of the program, allowing them to communicate and coordinate their activities efficiently. Multi-threading is often used to improve performance by utilizing multiple processor cores or achieving better responsiveness by performing tasks concurrently.

In summary, multi-programming focuses on running multiple programs concurrently, multi-tasking allows multiple tasks or applications to run simultaneously for user interaction, and multi-threading enables concurrent execution of smaller units of work within a single program to enhance performance or responsiveness.