**UNIT-3**

**MULTI-THREADING**

**Multithreading:** Creating Multiple Threads, isAlive(), join(), Thread priorities, Synchronization, Deadlock, wait(), notify(), notifyAll() methods, Inter-Thread Communication, suspend, resume & stop the threads.

**Multithreading: --**

1. It is a process of executing multiple threads simultaneously.
2. A thread is a lightweight process(sub-process), the smallest unit of processing.
3. Multithreading and multiprocessing both are used to achieve multitasking.
4. We use multithreading than multiprocessing because thread use a shared memory area. They don’t allocate separate memory area, so saves memory, and the context switching between threads takes less time than process.

**e.g.,** It is mostly used in games, animation etc.

**Advantages –**

1. Threads does not restrict the user because threads are independent and you can perform multiple operations at same time.
2. Saves time.
3. If an exception occurs in a single thread, then it does not affect other.

**Multitasking –**

1. It is a process of executing multiple tasks simultaneously.
2. Multitasking is used for a maximum utilization of CPU.

Multitasking can be achieved in two ways:

1. Process based multitasking(multiprocessing).
2. Thread based multitasking(multithreading).
3. **Multiprocessing –**
4. Each process has an address in memory that is each process allocates a separate memory area.
5. A processes heavyweight.
6. Cost of communication between process is high.
7. Switching from one process to another requires some time for saving, loading registers, memory maps, updating lists etc.
8. **Multithreading –**
9. Thread shares the same memory address space.
10. A thread is lightweight.
11. Cost of communication between the thread is low.
12. At least one process for thread is required.

**Thread –** A thread represents the separate part of execution of a group of statement.

**Note: - At a time one thread is executed only.**

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|  | **Note: -** There can be multiple processes inside the OS, and one and one process can have multiple threads. |