Process Concept :-

The Process :-

- A process is basically a program in execution. The execution of a process must progress in a sequential fashion.

- A process is defined as an entity which represents the basic unit of work to be implemented in the system.

- To put it in simple terms, we write our computer programs in a text file and when we execute this program, it becomes a process which performs all the tasks mentioned in the program.

- When a program is loaded into the memory and it becomes a process, it can be divided into four sections – stack, heap, text and data. The following image shows a simplified layout of a process inside main memory

Stack
↑
↓
Heap
Data
Text

S. N.	Component & Description
1	**Stack (special area of computer memory which stores temporary variables)** The process Stack contains the temporary data such as method/function parameters, return address and local variables.
2	**Heap (is an area of dynamically allocated memory)** This is dynamically allocated memory to a process during its run time.(is the process of assigning the memory space during the execution time or the run time.)
3	**Text** This includes the current activity represented by the value of Program Counter and the contents of the processor's registers.(is a register in a computer processor that contains the location of the instruction that is being executed at the time.)
4	**Data** This section contains the global and static variables.

2.)Different Process States ;-

Processes in the operating system can be in any of the following states:
- NEW- The process is being created.
- READY- The process is waiting to be assigned to a processor.
- RUNNING- Instructions are being executed.
- WAITING- The process is waiting for some event to occur

- TERMINATED- The process has finished execution.

S.N.	State & Description
1	**Start** This is the initial state when a process is first started/created.
2	**Ready** The process is waiting to be assigned to a processor. Ready processes are waiting to have the processor allocated to them by the operating system so that they can run. Process may come into this state after **Start** state or while running it by but interrupted by the scheduler to assign CPU to some other process.
3	**Running** Once the process has been assigned to a processor by the OS scheduler, the process state is set to running and the processor executes its instructions.
4	**Waiting** Process moves into the waiting state if it needs to wait for a resource, such as waiting for user input, or waiting for a file to become available.
5	**Terminated or Exit** Once the process finishes its execution, or it is terminated by the operating system, it is moved to the terminated state where it waits to be removed from main memory.
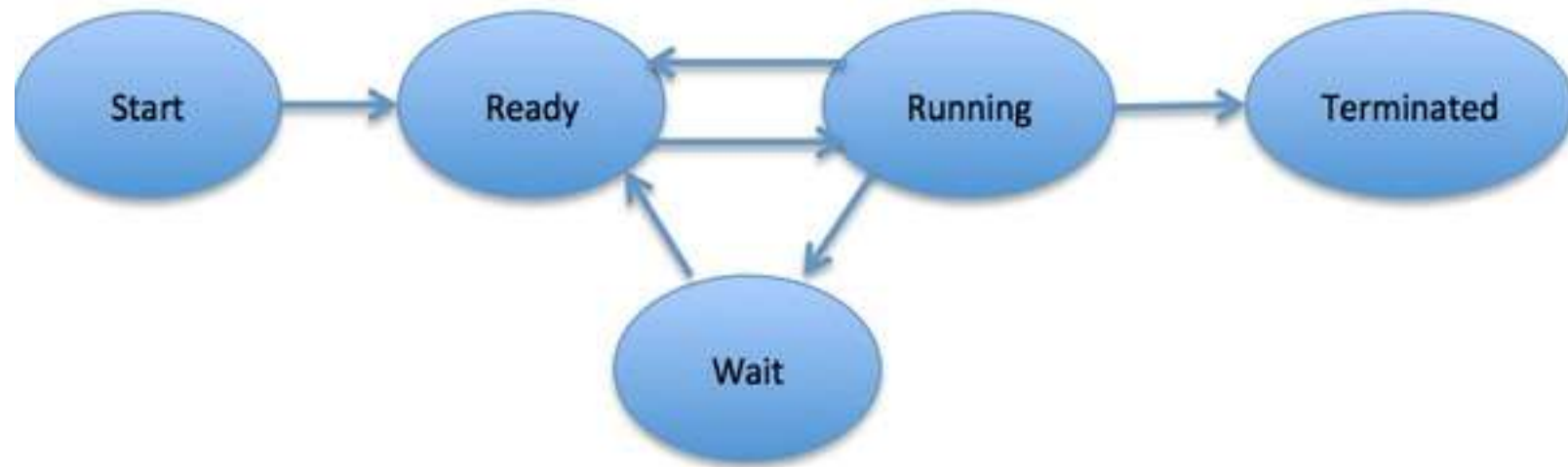
3.) Process Control Block:-

- There is a Process Control Block for each process, enclosing all the information about the process. It is a data structure, which contains the following:

- **Process State**: It can be running, waiting etc.

- **Process ID** and the **parent process ID**.

- CPU registers and Program Counter. **Program Counter** holds the address of the next instruction to be executed for that process.

- **CPU Scheduling** information: Such as priority information and pointers to scheduling queues.

- **Memory Management information**: For example, page tables or segment tables.(**Segment table** contains real address of **page table** along with the length of the **page table**)

- **Accounting information**: The User and kernel CPU time consumed, account numbers, limits, etc.

- **I/O Status information**: Devices allocated, open file tables, etc.

S.N.	Information & Description
1	**Process State** The current state of the process i.e., whether it is ready, running, waiting, or whatever.
2	**Process privileges (facility)** This is required to allow/disallow access to system resources.
3	**Process ID** Unique identification for each of the process in the operating system.
4	**Pointer** A pointer to parent process.
5	**Program Counter** Program Counter is a pointer to the address of the next instruction to be executed for this process.
6	**CPU registers** Various CPU registers where process need to be stored for execution for running state.
7	**CPU Scheduling Information** Process priority and other scheduling information which is required to schedule the process.
8	**Memory management information** This includes the information of page table, memory limits, Segment table depending on memory used by the operating system.
9	**Accounting information** This includes the amount of CPU used for process execution, time limits, execution ID etc.
10	**IO status information** This includes a list of I/O devices allocated to the process.

Process ID
State
Pointer
Priority
Program counter
CPU registers
I/O information
Accounting information
etc...