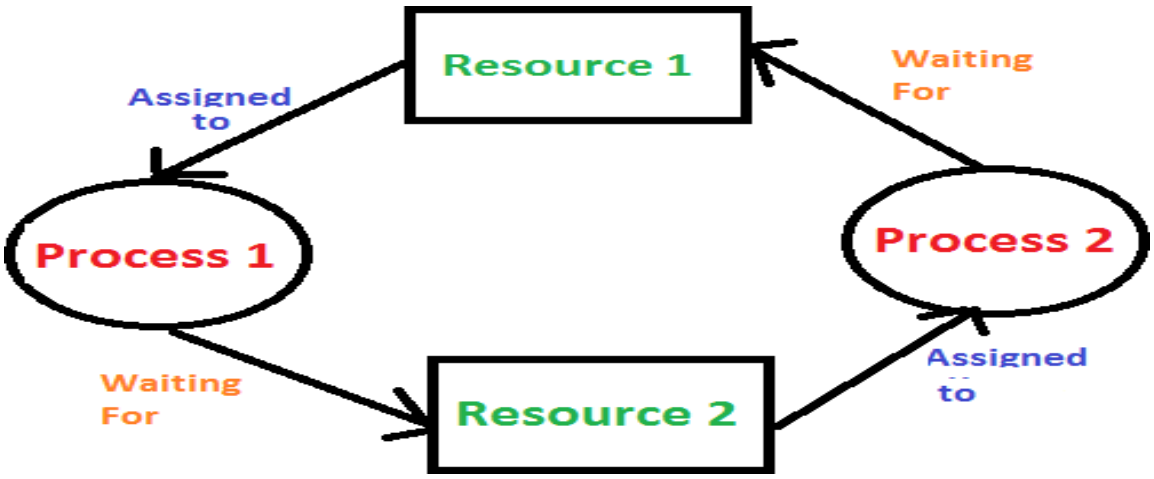
Paper Name:Operating System

Prepared by:Debanjali Jana

Deadlock:

When two or more processes are holding one or more resources with them and are waiting for some additional resources which are held by some other waiting processes then a situation arises in which execution of these waiting processes cannot continue any further and as a result the processes wait indefinitely. This situation is called deadlock.

Let us assume that there are two processes Process 1 and Process 2. There are two different resources Resource 1 and Resource 2. Resource 1 is assigned to Process 1 and Resource 2 is assigned to Process 2.



After some time, Process 1 demands for Resource 2 which is being used by Process2.Process1 halts its execution since it can't complete without Resource 2. Process 2 also demands for Resource 1 which is being used by Process 1. Process 2 also stops its execution because it can't continue without Resource 1.

In this scenario, Process 1 and Process 2 are in deadlock as each of them needs the other's resource to complete their execution but neither of them is willing to release their resources.

Necessary conditions for deadlock:

A deadlock occurs if the four conditions hold true.

1. Mutual exclusion:

There must be at least one non-shareable resource that is blocked by a process. No other process can share the resource. Hence another process requesting the same non-shareable resource has to wait.

2. **Hold and wait:**

A process must be holding at least one resource and waiting to acquire additional resources that are currently being held by other processes.

3. **No preemption:**

A resource, once allocated to a process cannot be pre-empted by operating system unless a process voluntarily releases the resource. A process can only release a resource voluntarily.

4. **Circular wait:**

There must be a set of waiting processes such as $\{P_0, P_1, P_2, \ldots P_n)$ such that P_0

is waiting for a resource held by P_1

P_1 is waiting for a resource held by P_2

…….

P_n is waiting for a resource held by P_0

This forms a circular chain.
