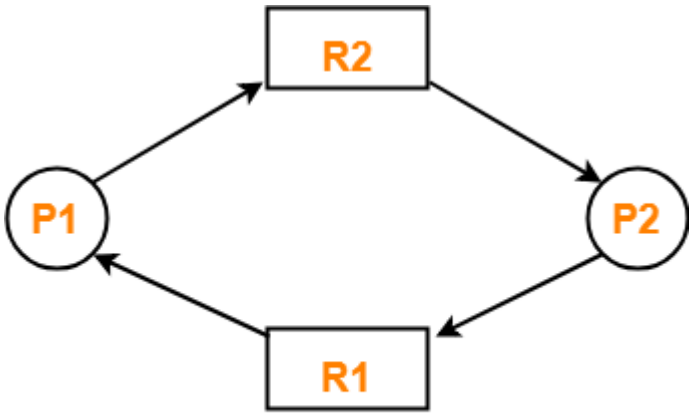
Deadlock in OS

Deadlock is a situation where-

- The execution of two or more processes is blocked because each process holds some resource and waits for another resource held by some other process.

Example-



Example of a deadlock

Here

- Process P1 holds resource R1 and waits for resource R2 which is held by process P2.
- Process P2 holds resource R2 and waits for resource R1 which is held by process P1.
- None of the two processes can complete and release their resource.
- Thus, both the processes keep waiting infinitely.

Conditions For Deadlock-

There are following 4 necessary conditions for the occurrence of deadlock-

1. Mutual Exclusion-

- There must exist at least one resource in the system which can be used by only one process at a time.
- If there exists no such resource, then deadlock will never occur.

2. Hold and Wait-

- There must exist a process which holds some resource and waits for another resource held by some other process.

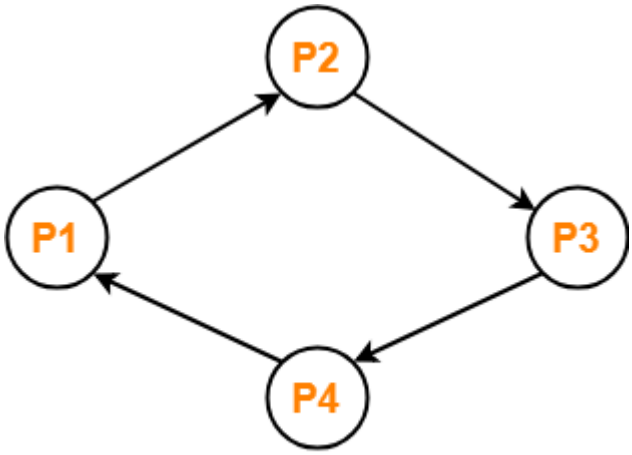
3. No Preemption-

- Once the resource has been allocated to the process, it cannot be preempted.
- It means resource can not be snatched forcefully from one process and given to the other process.

- The process must release the resource voluntarily by itself.

4. Circular Wait-

- All the processes must wait for the resource in a cyclic manner where the last process waits for the resource held by the first process.



Circular Wait

Here,

- Process P1 waits for a resource held by process P2.
- Process P2 waits for a resource held by process P3.
- Process P3 waits for a resource held by process P4.
- Process P4 waits for a resource held by process P1.

All these 4 conditions must hold simultaneously for the occurrence of deadlock.
If any of these conditions fail, then the system can be ensured deadlock free.