

# Operating System: Deadlock Prevention

By: Vishvadeep Gothi



# VISHVADEEP GOTHI SIR

**AIR- 19, 119, 440, 682  
in GATE**



**ME from IISc Bangalore  
Mtech BITS Pilani in Data  
Science**



**14+ Years of Teaching Experience,  
10+ Years in GATE/IES**



**Subjects Taken:**  
Computer Organization & Architecture,  
data structure, operating system,  
C-Programming, Data science,  
Machine Learning, Python,  
coding interview problems,





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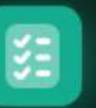


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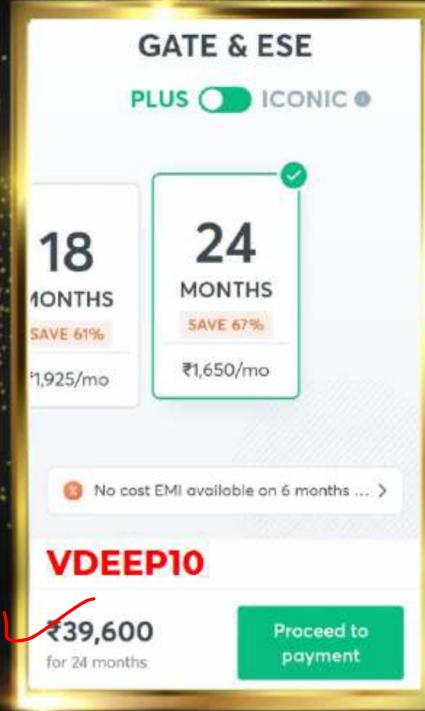
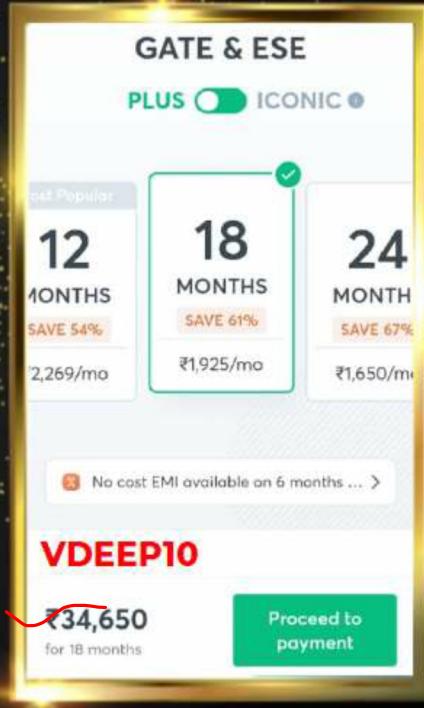
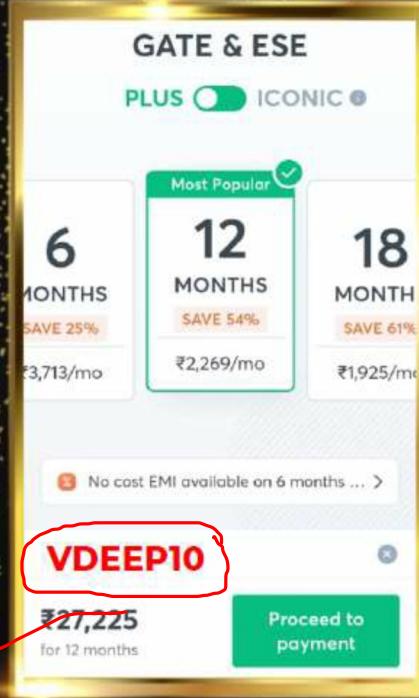


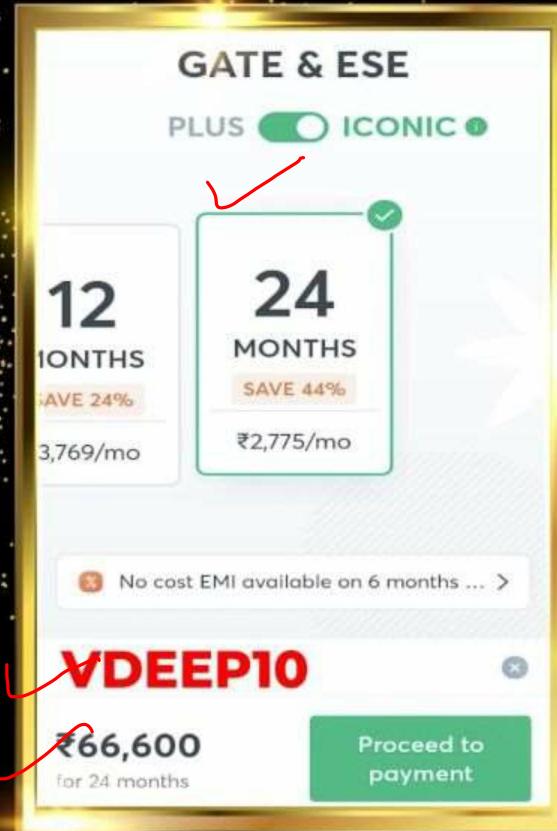
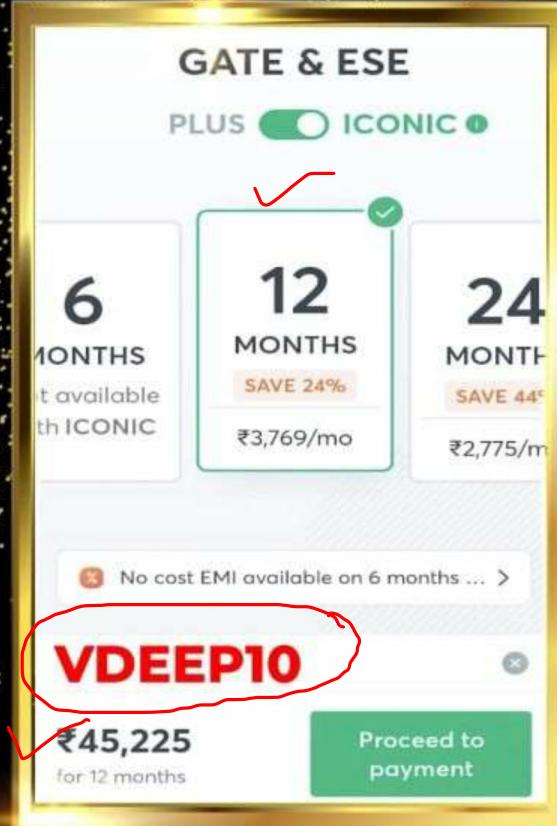
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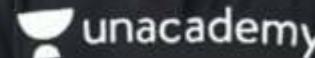
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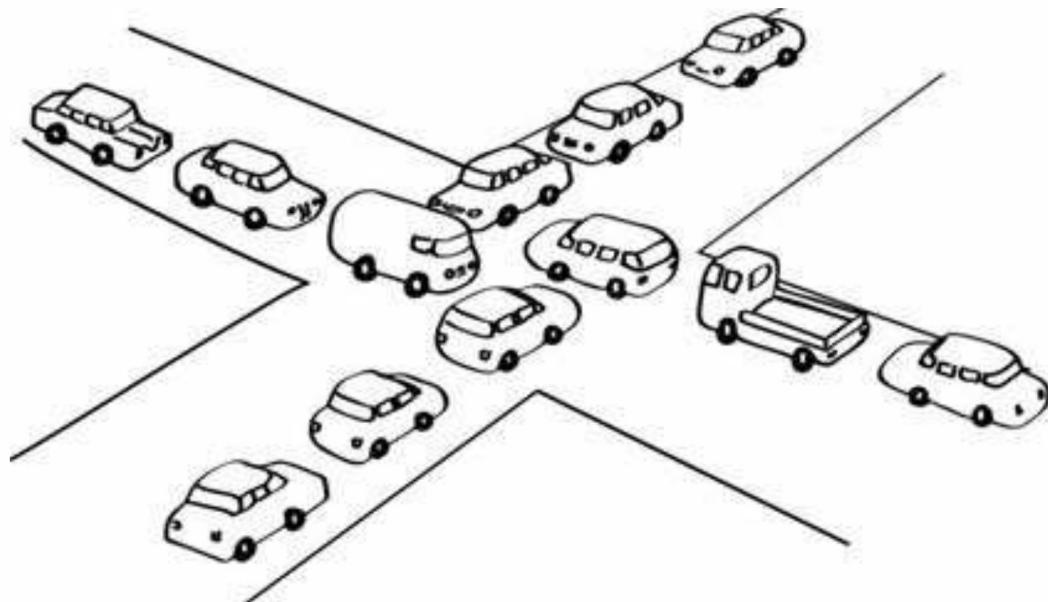
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# Deadlock

If two or more processes are waiting for such an event which is never going to occur



# Deadlock



# Necessary Conditions for Deadlock

Deadlock can occur only when all following conditions are satisfied:

1. Mutual Exclusion
2. Hold & Wait
3. No-preemption
4. Circular Wait

# Recovery From Deadlock

1. Make Sure that deadlock never occur
  - Prevent the system from deadlock or avoid deadlock
2. Allow deadlock, detect and recover
3. Pretend that there is no any deadlock



# Deadlock Prevention

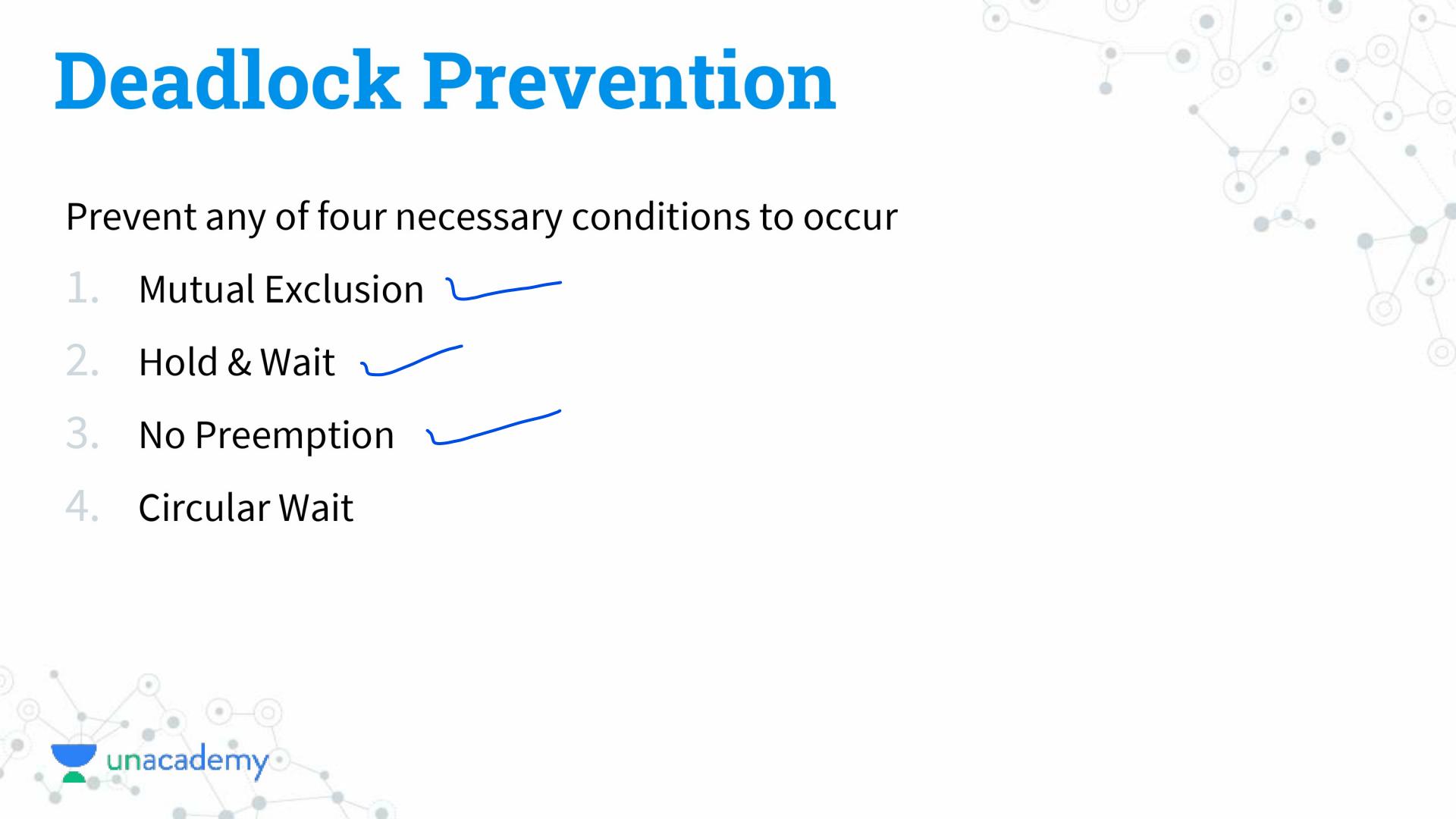
Prevent any of four necessary conditions to occur



# Deadlock Prevention

Prevent any of four necessary conditions to occur

1. Mutual Exclusion ✓
2. Hold & Wait ✓
3. No Preemption ✓
4. Circular Wait



# Preventing Mutual Exclusion



# Preventing Mutual Exclusion

- ◎ Have enough resources to provide simultaneous execution
- ◎ Make all processes independent

↳ practically impossible

ex:- We cannot give hard disc to every one at at time .

required resources  
will be so many

# Preventing Hold & Wait

→ processes should either hold or only wait



# Preventing Hold & Wait

- ◎ A process will either hold or wait but not together

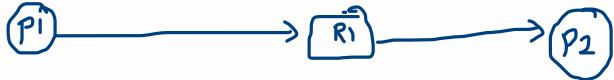
1. If all resources are available then acquire or else just wait for all.

(process may suffer from starvation.)

2- If process is trying to acquire a resource which is not available, while holding some resources, then process will release the allocated resources.

3. If a process holds resources but not using them, then there will be poor utilization of resources.

# Preventing No Preemption



P1 requests for R1, & R1 is held by P2 - P2 ps also  
in wait for other process/resource.

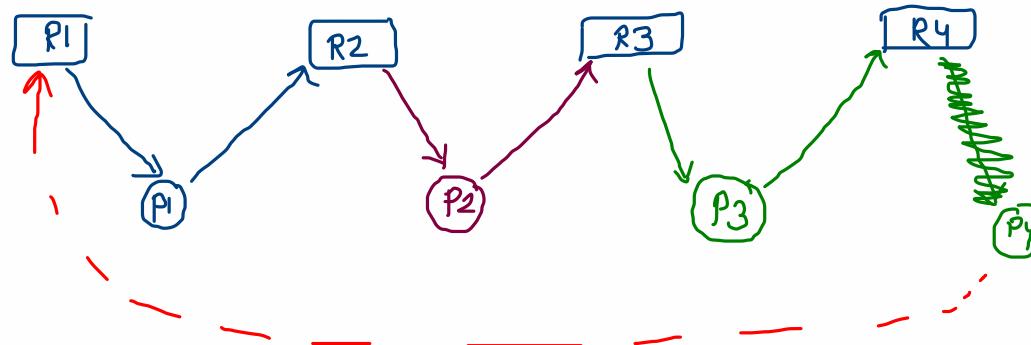
OS may preempt R1 from P2 and will give it to P1.

# Preventing No Preemption

- ◎ Preempt one or more resources from processes



# Preventing Circular Wait



# Preventing Circular Wait

1. All resources have been given sequence numbers (unique)  $R_1, R_2, R_3, \dots$
2. Any process while holding a resource  $R_i$ , can request for  $R_j$  only when  $j > i$ .
3. If a process is holding a resource  $R_i$ , and wants another resource  $R_j$ , when  $j < i$ . Then process will have to release  $R_i$  and will have to acquire  $R_j$  first.

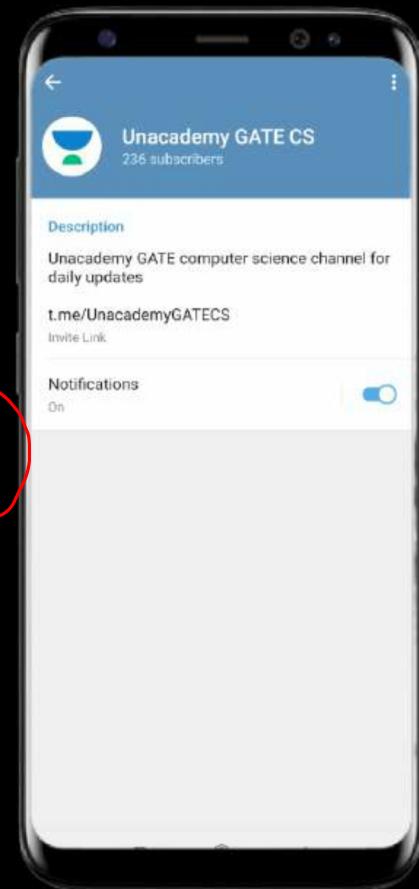
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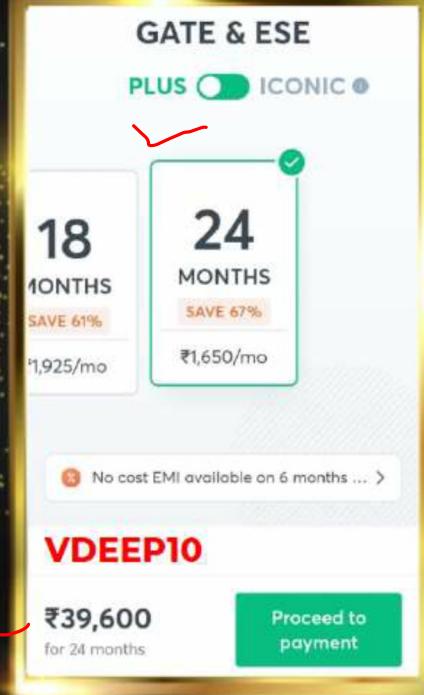
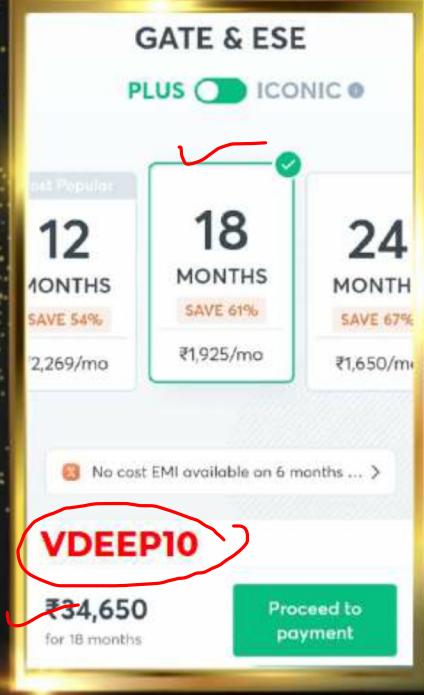
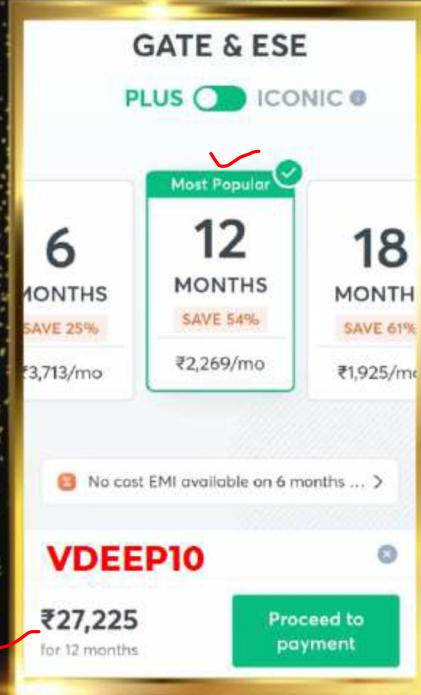
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