

Operating System: Deadlock Prevention

By: Vishvadeep Gothi



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**AIR- 19, 119, 440, 682
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**ME from IISc Bangalore
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**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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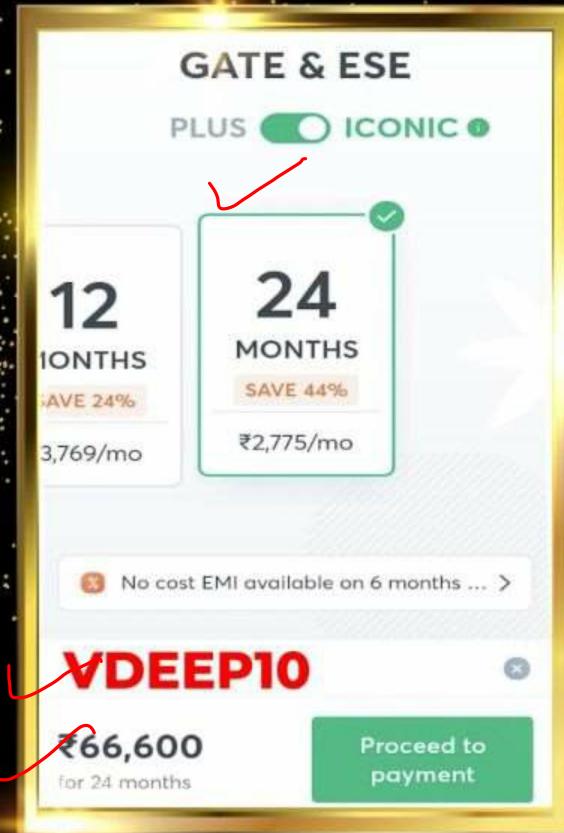
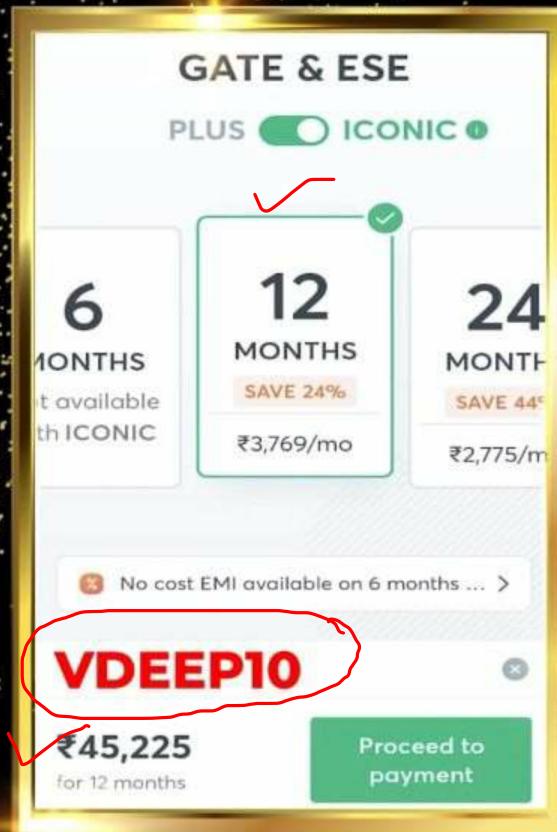
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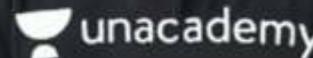
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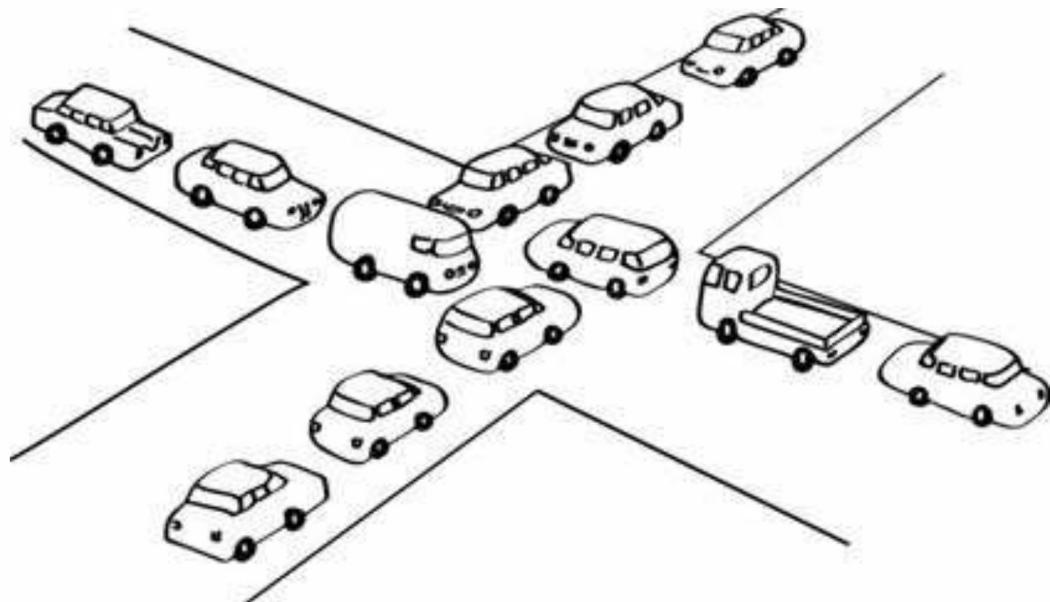
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Deadlock

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

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

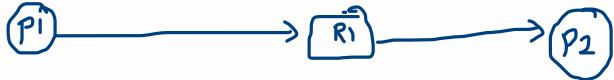
1. If all resources are available then acquire or else just wait for all.

(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.

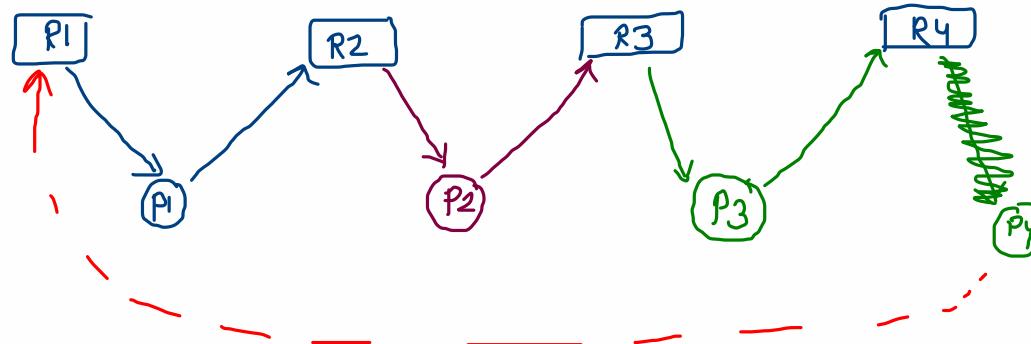
OS may preempt R1 from P2 and will give it to P1.

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.

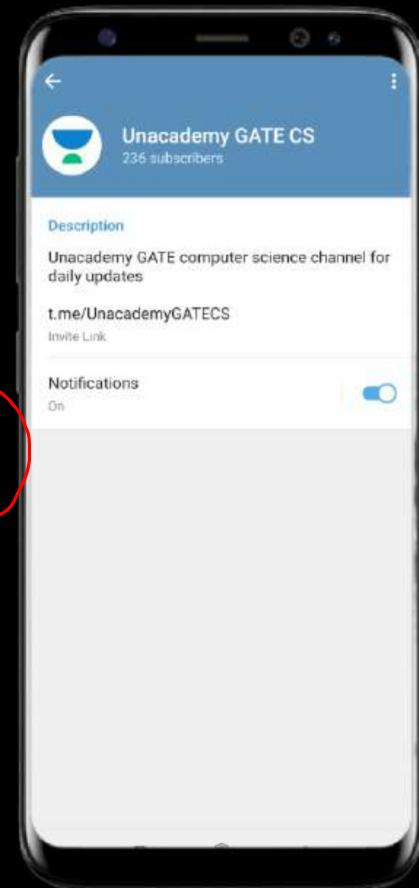
Next Class

Deadlock Avoidance

Banker's Algorithm



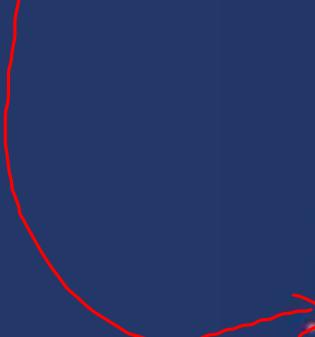
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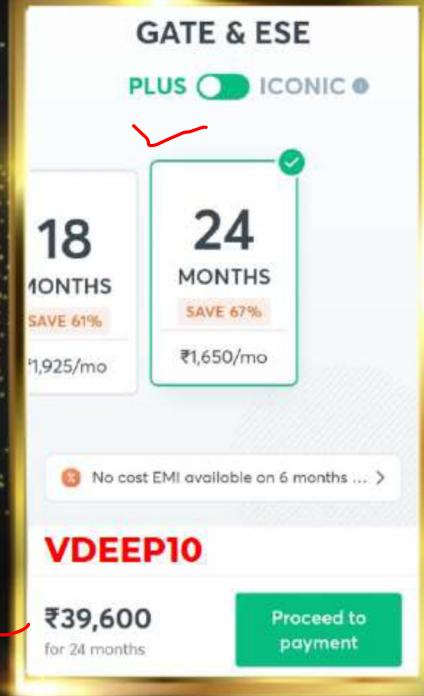
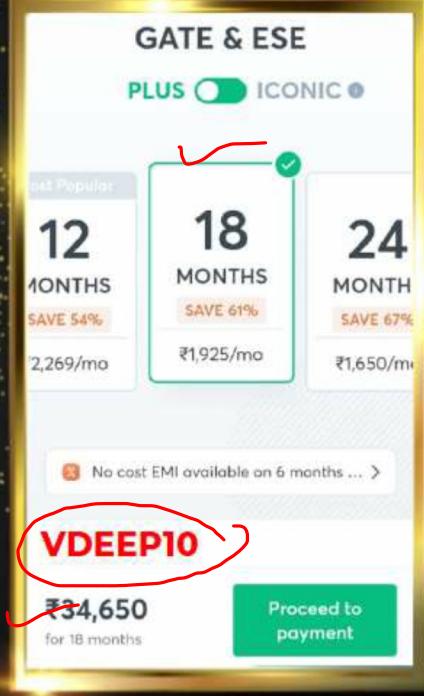
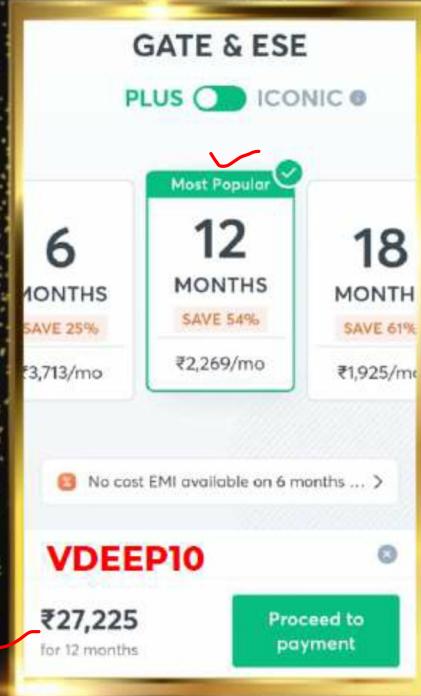


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