

Operating System: Questions on Deadlock

By: Vishvadeep Gothi



VISHVADEEP GOTHI SIR

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



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



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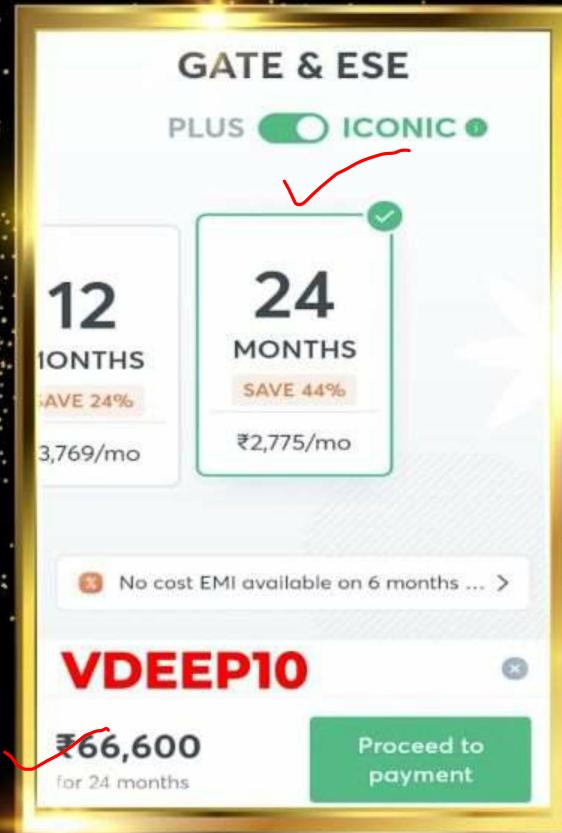
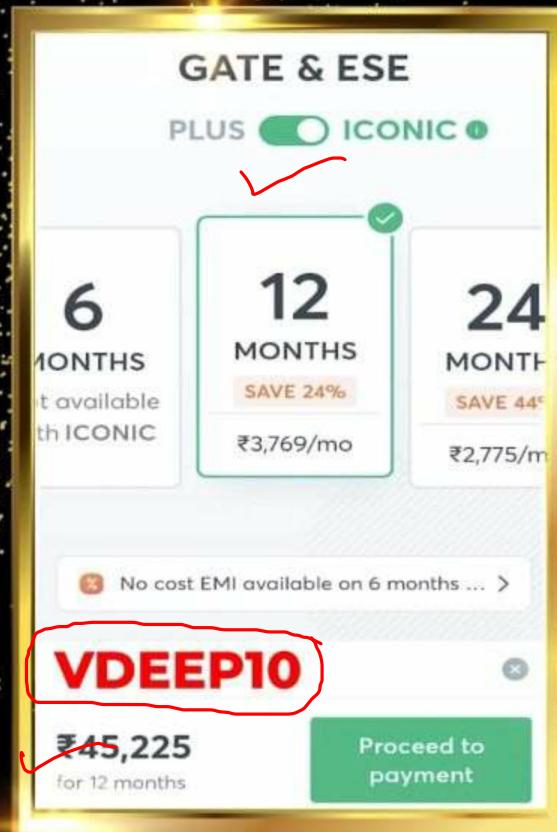
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Question 1

Ans :- 10

Consider a system with 3 processes A, B and C. All 3 processes require 4 resources each to execute. The minimum number of resources the system should have such that deadlock can never occur?

	Max	allocat'n	available
A	4	3	1
B	4	3	
C	4	3	

$\frac{9+1}{= 10}$

Question 2

Ans :- 20

Consider a system with 4 processes A, B, C and D. All 4 processes require 6 resources each to execute. The maximum number of resources the system should have such that deadlock may occur?

4

processes	max	allocat'n
A	6	5
B	6	5
C	6	5
D	6	5
		20

Question 3

Ans = 2

Consider a system with 3 processes that share 4 instances of the same resource type. Each process can request a maximum of K instances. Resource instances can be requested and released only one at a time. The largest value of K that will always avoid deadlock is ____.

Processes	max	allocation	available
p ₁	K=2	1	1
p ₂	K=2	1	1
p ₃	K=2	1	1

Question 4

$$\text{Ans} = n(k-1)$$

for no deadlock $\Rightarrow n(k-1) + 1$
 $\Rightarrow nk - n + 1$

Consider a system with n processes with single resource R. Each process requires k instances to execute. What is the maximum instances of R to cause a deadlock?

Processes	Max	allocat ⁿ
p_1	k	$k-1$
p_2	k	$k-1$
p_3	k	\vdots
\vdots	\vdots	\vdots
p_n	k	$k-1$

$$n(k-1)$$

Question 5

Ans:- 5

A computer has six tape drives, with n processes competing for them. Each process may need two drives. What is the maximum value of n for the system to be deadlock free?

Process	Max	Allocat ⁿ	available
P ₁	2	1	1
P ₂	2	1	1
P ₃	2	1	1
P ₄	2	1	1
	2	1	1
	2	1	1

Question 6

Ans = 14

Consider the following scenario:

Process	Max	Allocation	<u>available</u>
P1	5	0 4	1
P2	4	0 3	
P3	6	0 5	
P4	2	0 1	

Minimum number of available resources required
to have system deadlock free?



Question 7 GATE-2004

Consider two processes P1 and P2 accessing the shared variables X and Y protected by two binary semaphores SX and SY respectively, both initialized to 1. P and V denote the usual semaphore operators, where P decrements the semaphore value and V increments the semaphore value. The pseudo-code of P1 and P2 is as follows:

P1:

```
while true do {  
    L1 : ... P(SX) | P(SY)  
    L2 : ... PSY) | PSX)  
    X = X + 1;  
    Y = Y - 1;  
    V (SX);  
    V (SY);}
```

P2:

```
while true do {  
    L3 : ... P(SX) | P(SY)  
    L4 : ... PSY) | PSX)  
    Y = Y + 1;  
    X = Y - 1;  
    V (SY);  
    V (SX);}
```

$$S_x = 1 \text{ } 0$$

$$S_y = 1 \text{ } 0$$

Question 7 Continue

In order to avoid deadlock the correct operators at L1, L2, L3 and L4 are respectively

- (A) P (SY), P (SX); P (SX), P (SY) ~~(C) P (SX), P (SX); P (SY), P (SY)~~
- (B) P (SX), P (SY); P (SY), P (SX) ~~(D) P (SX), P (SY); P (SX), P (SY)~~

Next Class

→ Deadlock Detection



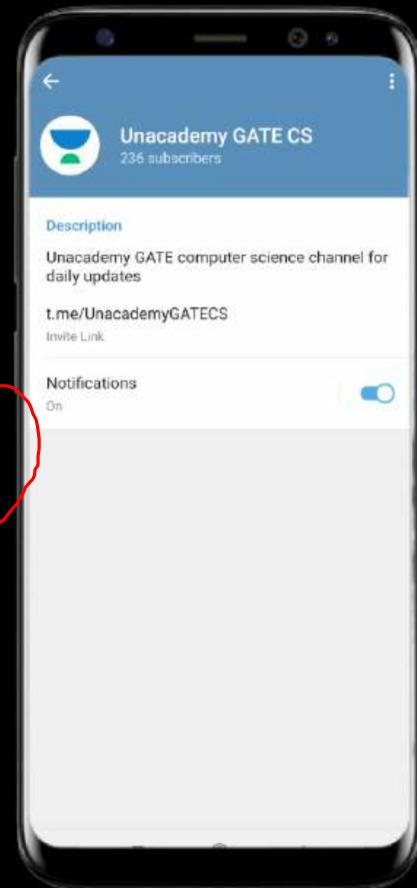
Deadlock Recovery

→ 30th June — system call & fork()

→ 1st July → Memory Mgmt



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