

Operating System: Solution of Critical Section

By: Vishvadeep Gothi



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**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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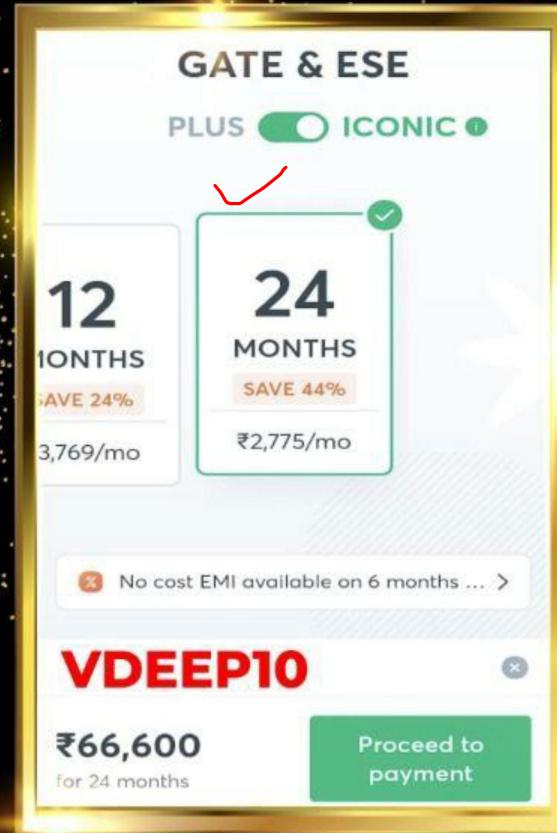
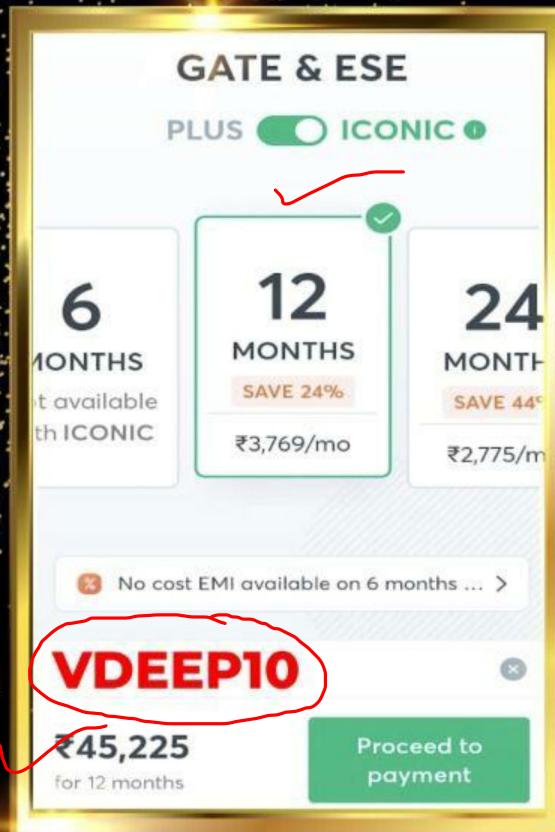
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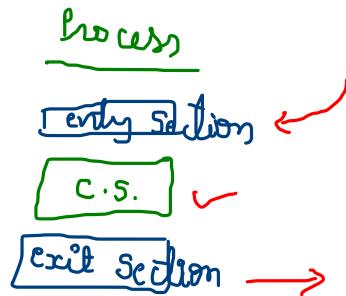
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Critical Section

The critical section is a code segment where the shared variables can be accessed



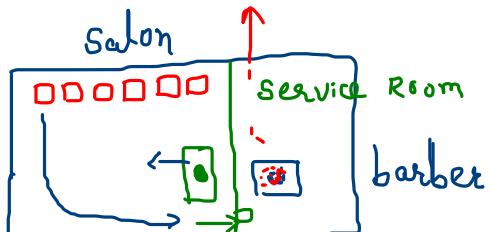
Solution of Critical Section Problem

Requirements of Critical Section problem solution:

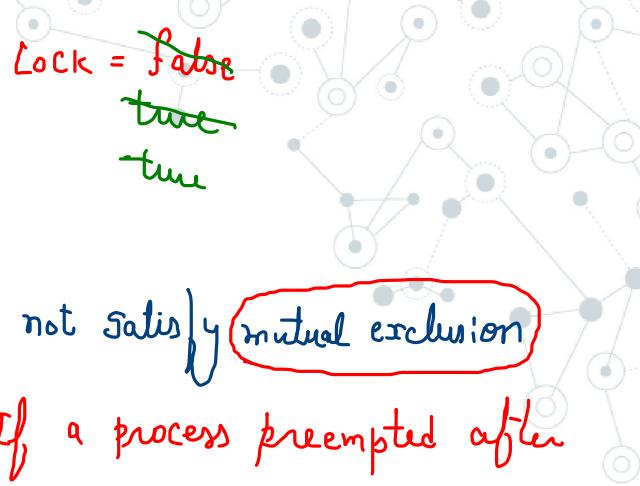
1. Mutual Exclusion
2. Progress
3. Bounded Waiting

*waiting of processes
should be bounded.*

*If one process is using c.s. then other process can not use that c.s.
If no any process in c.s. & at least one process wants to enter in c.s. then it should be allowed.*



Solution 1: Using Lock

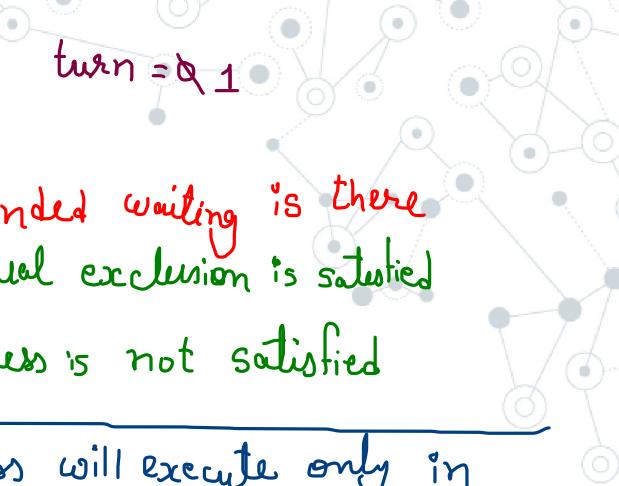


```
P0           P1
Boolean lock=false;
while(true)
{
    while(lock);
    lock=true;
    CS
    lock=false;
    RS;
}

while(true)
{
    while(lock);
    lock=true;
    CS
    lock=false;
    RS;
}
```

Progress is
Satisfied.

Solution 2: Using Turn



```
int turn=0;  
    p0  
while(true)  
{  
    while(turn!=0);  
        CS  
    turn=1;  
    RS;  
}
```

```
    p1  
while(true)  
{  
    while(turn!=0);  
        CS  
    turn=1;  
    RS;  
}
```

- Bounded waiting is there
- Mutual exclusion is satisfied
- Progress is not satisfied

2 process will execute only in strict alternate manner.

Solution 3: Peterson's Solution

```
Boolean Flag[2];  
int turn;  
P0
```

```
while(true) {
```

```
    Flag[0]=true;
```

```
    turn=1;
```

→ while(Flag[1] && turn==1);

CS

```
    Flag[0]=False;
```

RS;

flag[0] = false
flag[1] = false

P₁

```
while(true) {
```

```
    Flag[1]=true;
```

```
    turn=0
```

→ while(Flag[0] && turn==0);

CS

```
    Flag[1]=False;
```

RS;

→ M.E. is satisfied
→ Progress is also satisfied
→ Bounded waiting satisfied

}

Case 1:- Enter p0 in c.s. & try if p1 can enter

$$\text{flag}[0] = \cancel{f} T$$

$$\text{flag}[1] = f \quad T$$

$$\text{turn} = \cancel{x} 0$$

p1 can not enter into c.s.



Checking for bounded waiting :-

p0 enters in c.s.

$$\text{flag}[0] = f \cancel{t} \cancel{f} t$$

p1 waits outside c.s.

$$\text{flag}[1] = f t$$

p0 comes out

$$\text{turn} = \cancel{x} \cancel{0} 1$$

Solution 3: Peterson's Solution



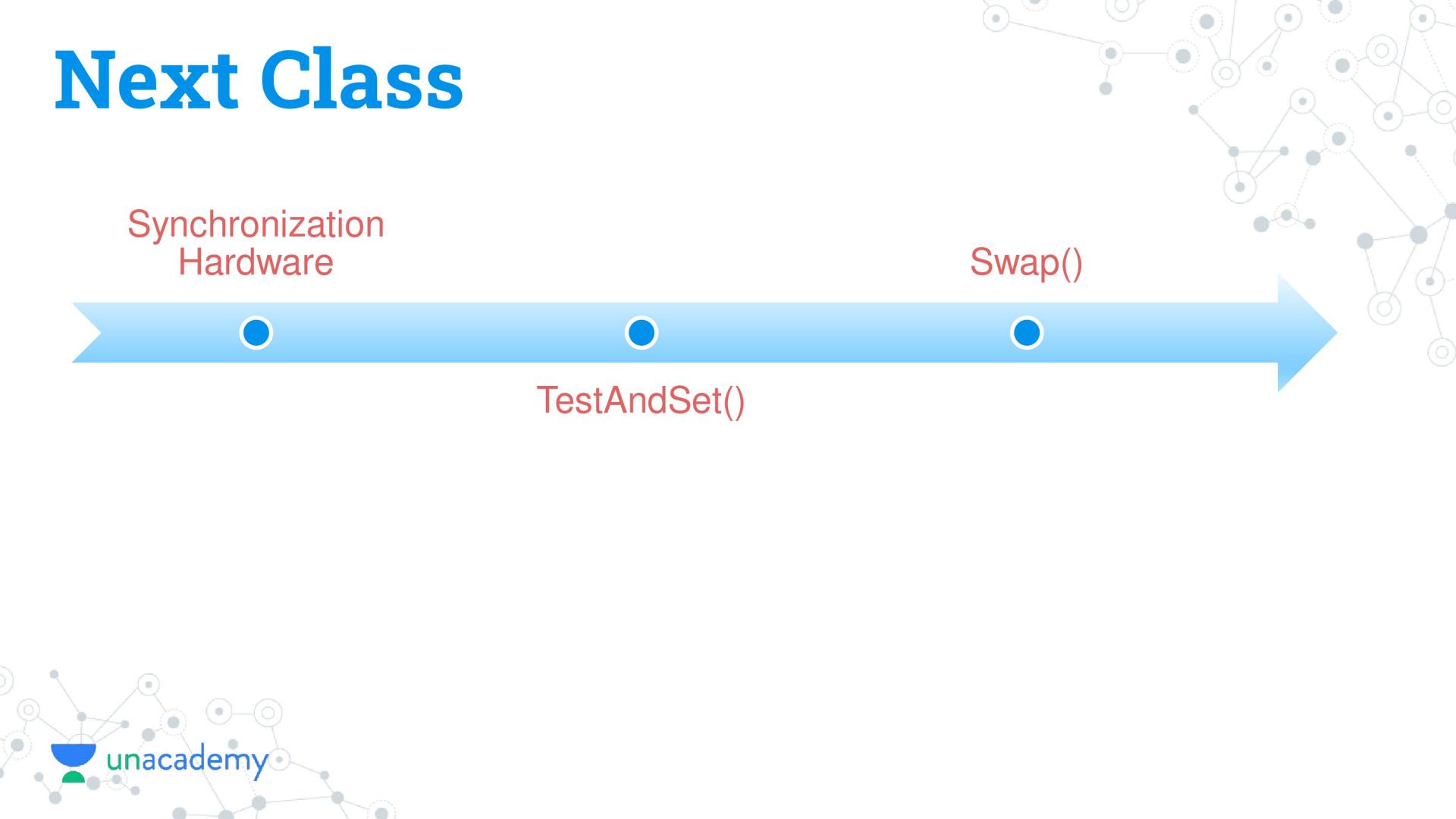
All 3 solutions \Rightarrow S/w solutions

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Hardware

Swap()

TestAndSet()



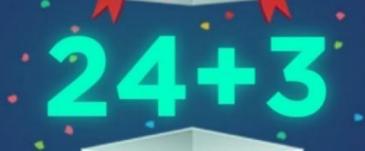
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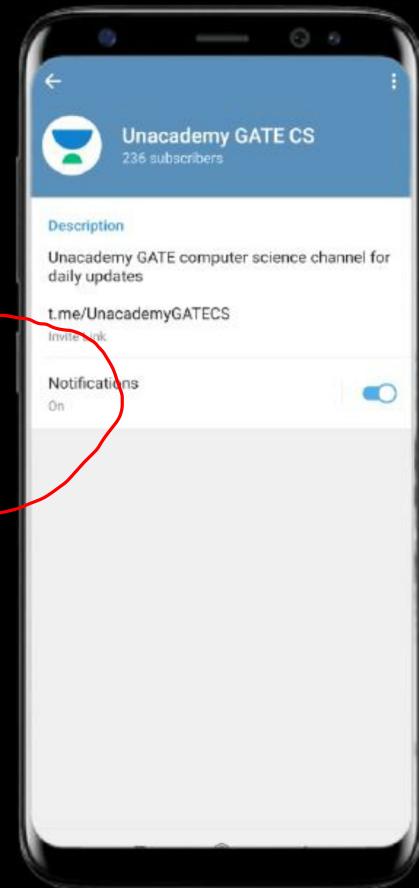
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