Pretend the allocated resource to P_i by modyfying the state as follows:

avaiable	=	available − request
allocation	=	allocation + request
Need	=	need − request

∴ if safe → then resource allocated to P_i

∴ in unsafe → P_i must wait, old resource allocation state is restored.

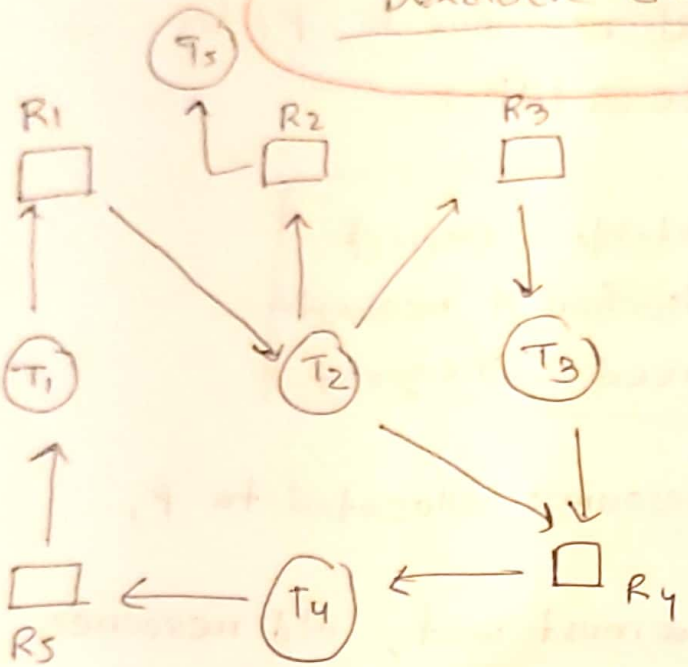
∴ complexity = $O(n^2m)$ deadlock avaidance worstcase

Deadlock avoidance → analyze the future

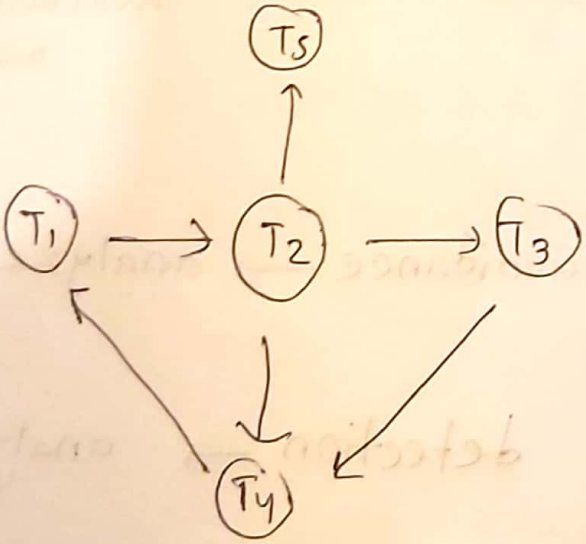
Deadlock detection → analyze the present

avoidance is better

Deadlock detection



Resource allocation Graph



wait for Graph

Q Five Processes P_0 to P_4

three resource type :- A (7 instance)
B (2 ")
C (6 ")

Process	Allocation			Request			Available		
	A	B	C	A	B	C	A	B	C
P_0	0	1	0	0	0	0	0	0	0
P_1	2	0	0	2	0	2			
P_2	3	0	3	0	0	0			
P_3	2	1	1	1	0	0			
P_4	0	0	2	0	0	2			

∴ check if there is any deadlock ?

Ans:-

Process		available
		0 0 0
P_0	—	0 1 0
P_2	—	3 1 3
P_1	—	5 1 3
P_3	—	7 2 4
P_4	—	7 2 6

∴ Here available is 0 0 0. But we can see P_0 request for 0 0 0, so P_0 can finish its and after its done its release its allocated resource 0 1 0.

∴ Now available resource

A	B	C
0	0	0
+0	+1	+0
0	1	0

∴ Now P_2 request $\leq$ available

0 0 0 $\leq$ 0 1 0

P_2 start executing & then release its resources.

	A	B	C
now available	0	1	0
	+3	+0	+3
	3	1	3

∴ Now P_1 request $\leq$ available
(2, 0, 0) (3, 1, 3)

∴ P_1 executing & then release its allocated resource

	A	B	C
now available	3	1	3
	2	0	0
	5	1	3

∴ P_3 request $\leq$ available
(2, 1, 1) (5, 1, 3)

∴ P_3 start executing then release its resources.

	A	B	C
Now available	5	1	3
	2	1	1
	7	2	4

∴ Now P_4 request $\leq$ available

0 0 2 — 7 2 4

∴ P_4 start executing.

∴ Now available =

A	B	C
7	2	4
0	0	2
7	2	6

∴ so **we found a safe sequence**

$= \langle P_0, P_2, P_1, P_3, P_4 \rangle$

∴ so **there is no deadlock**.

Q

Process	Allocation			Request			available		
	A	B	C	A	B	C	A	B	C
P_0	0	1	0	0	0	0	0	0	0
P_1	2	0	0	2	0	2			
P_2	3	0	3	0	0	1			
P_3	2	1	1	1	0	0			
P_4	0	0	2	0	0	2			

∴ check if there is a deadlock?

Ans:

Process	available		
	A	B	C
	0	0	0
P_0	0	1	0
P_1	Not found enough available resource to start		
P_2	11		
P_3	11		
P_4	11		

∴ Here available 0, 0, 0

∴ P0 request ≤ available
(0, 0, 0)

∴ (0, 0, 0)

∴ P0 start executing & then after finish it releases its resource allocated.

∴ now available

A	B	C
0	0	0
+0	+1	+0
0	1	0

∴ now P1, P2, P3, P4 request > available.

∴ so didnot find any safe sequence to complete process

∴ The system is unsafe

So,

∴ There is a deadlock in the system.