Page No.
Date

* Deadlocks & Necessary Conditions for deadlocks (Paper PYQ)

* Ressource Allocation Graph

It is the complete information about all the processes which are holding some ressources or waiting for some resources.

Set of Vertices

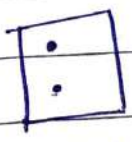
V
- → Set of Processes $\{P_1, P_2, P_3 \cdots P_n\}$
- → Set of Resources $\{R_1, R_2, R_3 \cdots R_n\}$

Set of Edges

E
- → $P_i \longrightarrow R_j$ (Request Edge)
- → $R_j \longrightarrow P_i$ (Assignment Edge)

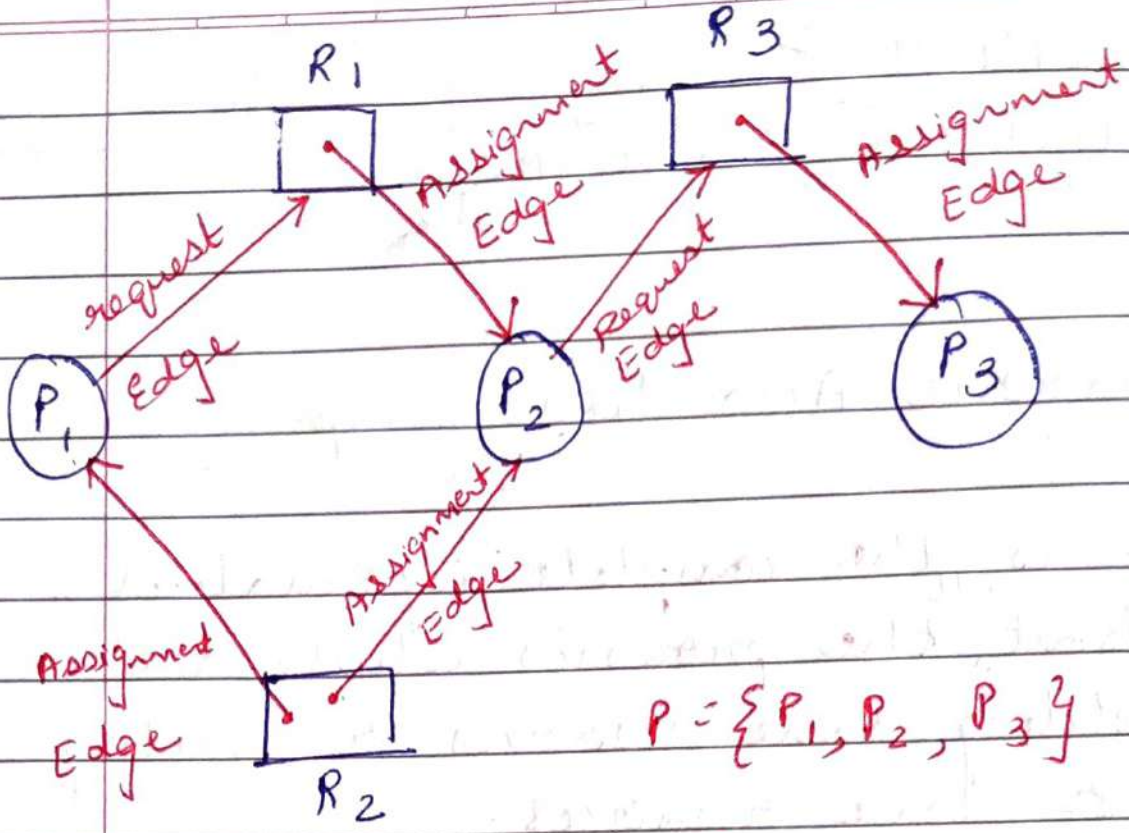
Notations

□ → Resource type



instance of resource type

○ → Process



$P = \{P_1, P_2, P_3\}$

$R = \{R_1, R_2, R_3\}$

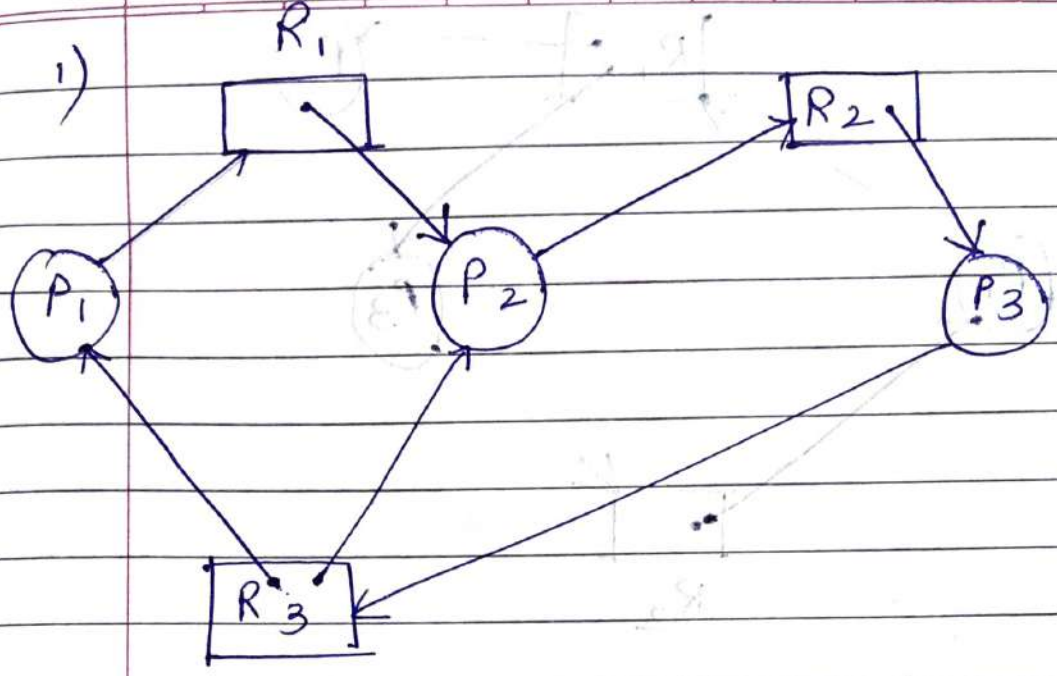
$E = \{P_1 \to R_1, P_2 \to R_3, R_1 \to P_2, R_2 \to P_1, R_2 \to P_2, R_3 \to P_3\}$

If in resource allocation graph there is no cycle, then there is no deadlock.

If in resource allocation graph ~~there~~ cycle exist then deadlock may exist.

Page No.
Date / - /

1)

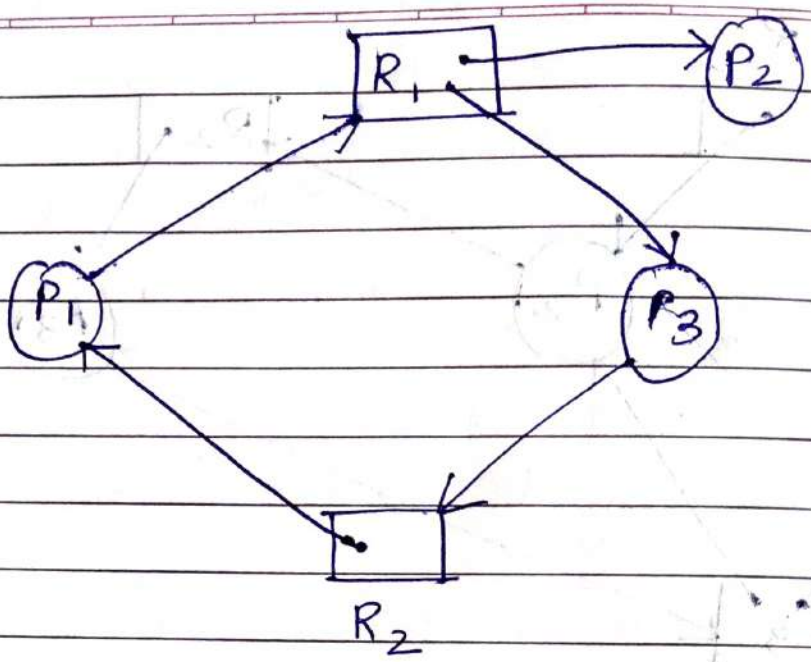


Process	Allocation			Request			Availability		
	R_1	R_2	R_3	R_1	R_2	R_3	R_1	R_2	R_3
P_1	0	0	1	1	0	0	0	0	0
P_2	1	0	1	0	1	0			
P_3	0	1	0	0	0	1			

- There are no instances available currently & ~~both~~ all the processes require a resource to execute.
- Therefore, none of the process can be executed & both keeps waiting infinitely.

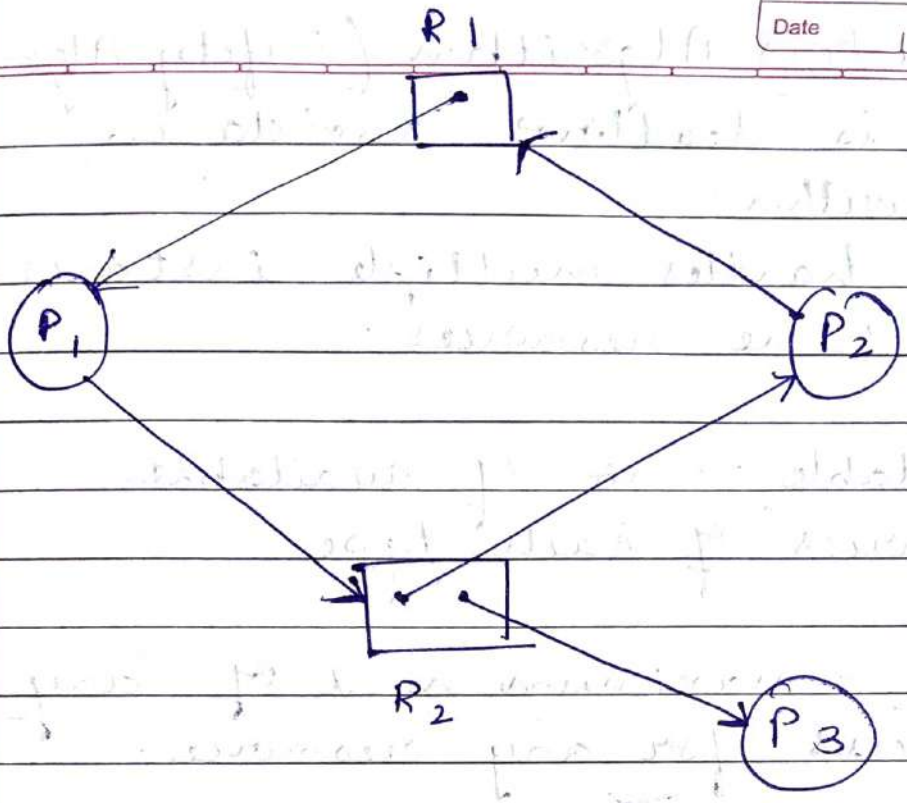
Thus, the system is in a deadlock state.

2)



Process	Allocation		Request		Availability	
	R_1	R_2	R_1	R_2	R_1	R_2
✓ P_1	0	1	1	0	0	0
✓ P_2	1	0	0	0	1	0
✓ P_3	1	0	0	1	1	0
					0	1
					1	1
					1	0
					2	1

~~All~~ All 3 processes got executed, means the system has no deadlock.



Process	Allocation		Request		Available	
	R_1	R_2	R_1	R_2	R_1	R_2
✓ P_1	1	0	0	1	0	0
✓ P_2	0	1	1	0	0	1
✓ P_3	0	1	0	0	0	1
					1	0
					1	1
					0	1
					1	2

All 3 processes got executed, means the system has no deadlock.