

## Data structure exercises

### Banker's algorithm

1) Examine the following table (Table 1) of resource requirements for five (5) processes (P1-P5), four (4) resource types (A, B, C, D), and total resources are A=10, B=6, C=15, and D=10.

a) Determine whether the current system is in a safe state or not using the Banker's Algorithm. Show the processes' execution sequence and changes in the available vector elements in each step.

b) If a request from P4 arrives for (2, 1, 0, 1), can the request be granted immediately? Show all necessary steps.

Process	Allocation (A, B, C, D)	Max (A, B, C, D)
P1	(3, 2, 2, 1)	(5, 3, 4, 2)
P2	(2, 1, 3, 2)	(4, 2, 5, 4)
P3	(1, 1, 0, 3)	(3, 2, 2, 4)
P4	(3, 0, 2, 1)	(4, 1, 3, 2)
P5	(0, 2, 1, 0)	(2, 3, 4, 2)

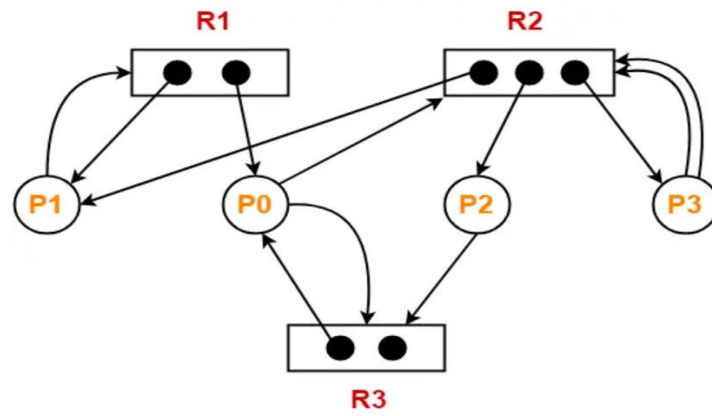
2)

Assume that there are three resources, A, B, and C. There are 4 processes P<sub>0</sub> to P<sub>3</sub>. At T<sub>0</sub> we have the following snapshot of the system:

	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P <sub>0</sub>	1	0	1	2	1	1	2	1	1
P <sub>1</sub>	2	1	2	5	4	4			
P <sub>2</sub>	3	0	0	3	1	1			
P <sub>3</sub>	1	0	1	1	1	1			

1. Create the need matrix.
2. Is the system in a safe state? Why or why not?

3) The given figure indicates the resource allocation graph(RAG)



- a) Analyze the given Resource Allocation Graph (RAG) to find a safe sequence.