

CSE321: Operating Systems

Quiz-3

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[C05] i) Using the Banker's Safety algorithm, determine whether or not the state is unsafe. If the state is safe, illustrate the order in which the processes may complete. Otherwise, illustrate why the state is unsafe. You must calculate the Need matrix. [5]

	Allocation			Max			Available			Need [max - Allocation]		
	R1	R2	R3	R1	R2	R3	R1	R2	R3	R1	R2	R3
✓ P0	4	3	5	8	6	7	6	9	3	4	3	2
✓ P1	5	2	4	7	5	10				2	3	6
✓ P2	2	2	0	10	5	8				8	3	8
✓ P3	3	1	4	8	5	6				5	4	2
P4	5	1	2	5	5	10				0	4	8

ii) If a request from process P0 arrives for [0, 3, 1], can the request be granted immediately? [2+5]

work [Need ≤ Available]

6 9 3

4 3 5 → P0

10 12 8

5 2 4 → P1

15 14 12

2 2 0 → P2

17 16 12

3 1 4 → P3

20 17 16

5 1 2 → P4

25 18 18

P0 → P1 → P2 → P3 → P4

P0	P1	P2	P3	P4
FT	FT	FT	FT	FT

This state is safe.

safe order:

P0 → P1 → P2 → P3 → P4

2. since,

$$[0, 3, 1] \leq [6, 9, 3]$$

$$[0, 3, 1] \leq [4, 3, 2]$$

So, P_0 :

$$\text{Allocation} = [4, 3, 5] + [0, 3, 1] = [4, 6, 6]$$

$$\text{Need} = [4, 3, 2] - [0, 3, 1] = [4, 0, 1]$$

$$\text{Available} = [6, 9, 3] - [0, 3, 1] = [6, 6, 2]$$

Available

P_1	R_2	R_3
6	6	2

Allocation

	R_1	R_2	R_3
✓ 4	6	6	
✓ 5	2	4	
✓ 2	2	0	
✓ 3	1	4	
✓ 5	1	2	

Need

	R_1	R_2	R_3
4	0	1	
2	3	6	
8	3	8	
5	4	2	
0	4	8	

P_0, P_1, P_2, P_3, P_4

P_1	R_1	R_2	R_3	R_4

$P_0 \rightarrow P_1 \rightarrow P_2 \rightarrow P_3 \rightarrow P_4$

work [Need \leq Available]

6	6	2	
4	6	6	$\rightarrow P_0$
10	12	8	
5	2	4	$\rightarrow P_1$
15	14	12	
2	2	0	$\rightarrow P_2$
17	16	12	
3	1	4	$\rightarrow P_3$
20	17	16	
5	1	2	$\rightarrow P_4$
25	18	18	

"Since there is no deadlock occur.

The request can be granted immediately.