Deadlock Exercises

1- Consider the following snapshot of a system:

Allocation				
	A	*B*	*C*	*D*
P0	0	0	1	2
P1	1	0	0	0
P2	1	3	5	4
P3	0	6	3	2
P4	0	0	1	4

Max				
	A	*B*	*C*	*D*
P0	0	0	1	2
P1	1	7	5	0
P2	2	3	5	6
P3	0	6	5	2
P4	0	6	5	6

Available			
A	*B*	*C*	*D*
1	5	2	0

Answer the following questions using the banker's algorithm:
a. What is the content of the matrix ***Need***?

Need				
	A	*B*	*C*	*D*
P0	0	0	0	0
P1	0	7	5	0
P2	1	0	0	2
P3	0	0	2	0
P4	0	6	4	2

b. Is the system in a safe state?

Allocation				
	A	*B*	*C*	*D*
P0	0	0	1	2
P1	1	0	0	0
P2	1	3	5	4
P3	0	6	3	2
P4	0	0	1	4

Need				
	A	*B*	*C*	*D*
P0	0	0	0	0
P1	0	7	5	0
P2	1	0	0	2
P3	0	0	2	0
P4	0	6	4	2

Available(1,5,2,0)				
	A	*B*	*C*	*D*
P0	1	5	3	2
P2	2	8	8	6
P3	2	14	11	8
P4	2	14	12	12
P1	3	14	12	12

The state is safe

c. If a request from process P_1 arrives for (0,4,2,0), can the request be granted immediately?

Allocation				
	A	*B*	*C*	*D*
P0	0	0	1	2
P1	1	4	2	0
P2	1	3	5	4
P3	0	6	3	2
P4	0	0	1	4

Need				
	A	*B*	*C*	*D*
P0	0	0	0	0
P1	0	3	3	0
P2	1	0	0	2
P3	0	0	2	0
P4	0	6	4	2

Available(1,1,0,0)				
	A	*B*	*C*	*D*
P0	1	1	1	2
P2	2	4	6	6
P3	2	10	9	8
P4	2	10	10	12
P1	3	14	12	12

Yes

2. Consider the following snapshot of a system:

Allocation				
	A	*B*	*C*	*D*
P0	3	0	1	4
P1	2	2	1	0
P2	3	1	2	1
P3	0	5	1	0
P4	4	2	1	2

Max				
	A	*B*	*C*	*D*
P0	5	1	1	7
P1	3	2	1	1
P2	3	3	2	1
P3	4	6	1	2
P4	6	3	2	5

Need				
	A	*B*	*C*	*D*
P0	2	1	0	3
P1	1	0	0	1
P2	0	2	0	0
P3	4	1	0	2
P4	2	1	1	3

Using the banker's algorithm, determine whether or not each of the following states is unsafe. If the state is safe, illustrate the order in which the processes may complete. Otherwise, illustrate why the state is unsafe.

a. ***Available*** = (0, 3, 0, 1)

Allocation				
	A	*B*	*C*	*D*
P0	3	0	1	4
P1	2	2	1	0
P2	3	1	2	1
P3	0	5	1	0
P4	4	2	1	2

Need				
	A	*B*	*C*	*D*
P0	2	1	0	3
P1	1	0	0	1
P2	0	2	0	0
P3	4	1	0	2
P4	2	1	1	3

Available				
	A	*B*	*C*	*D*
P2	3	4	2	2
P1	5	6	3	2
P3	5	11	4	2

The state is unsafe because both p0 and p4 need 3 instances of recourse D but only 2 available

b. ***Available*** = (1, 0, 0, 2)

c. ***Allocation***				
	A	*B*	*C*	*D*
P0	3	0	1	4
P1	2	2	1	0
P2	3	1	2	1
P3	0	5	1	0
P4	4	2	1	2

Need				
	A	*B*	*C*	*D*
P0	2	1	0	3
P1	1	0	0	1
P2	0	2	0	0
P3	4	1	0	2
P4	2	1	1	3

Available				
	A	*B*	*C*	*D*
P1	3	2	1	2
P2	6	3	3	3
P3	6	8	4	3
P4	10	10	5	5
P0	13	10	6	9

The state is safe

P1,P2,P3,P4,P0

Or

P1,P2,P3,P0,P4