

**UPPSALA UNIVERSITY
DEPARTMENT OF INFORMATION TECHNOLOGY**

**COMPUTER SYSTEMS/OPERATING SYSTEMS
Fall, 2007**

IN-CLASS EXERCISE 6

A system has three processes, P1, P2, and P3, and four types of resources, R1-R4. The total system resources are:

- R1 – 1 unit
- R2 – 2 units
- R3 – 1 unit
- R4 – 3 units

The needs and state of each process are:

- P1 holds 1 R2 and requests 1 R1
- P2 holds 1 R1 and 1 R2, and requests 1 R3
- P3 holds 1 R3 and requests 1 R2

1. Draw the resource allocation graph representing the current state of the system.

2. Is the system deadlocked? Explain.

In this problem you will apply the Bankers algorithm. You are given the following maximum needs matrix and the current resource allocation matrix.

Maximum Needs			
	A	B	C
P0	7	4	3
P1	3	2	2
P2	9	0	2
P3	2	2	2
P4	4	3	3

Total System Resources		
A	B	C
10	4	7

Current Resource Allocation			
	A	B	C
P0	0	1	0
P1	3	0	2
P2	3	0	2
P3	2	1	1
P4	0	0	2

1. Determine the remaining needs of each process for each resource and then show if the system is in a safe state. Assume that the processes will request the maximum resources.

Remaining Needs			
	A	B	C
P0			
P1			
P2			
P3			
P4			

2. If process P3 makes a request for a resource of type B, should the resource request be granted? Explain.

3. If a system is in an unsafe state, does that imply that the system is deadlocked? Explain.