Southern Methodist University
Bobby B. Lyle School of Engineering
Department of Computer Science
CS 7343/5343 Operating Systems and System Software

Homework 6

- **All students who are signed for this course at the CS 7343 must answer both questions.**
- **All students who are signed for this course at the CS 5343 must answer exactly one question.**

1. Consider the following snapshot of a system (P=Process, R=Resource) :

Available			
RA	RB	RC	RD
8	5	9	7

Maximum Demand				
	RA	RB	RC	RD
P0	3	2	1	4
P1	0	2	5	2
P2	5	1	0	5
P3	1	5	3	0
P4	3	0	3	3

Current Allocation				
	RA	RB	RC	RD
P0	1	0	1	1
P1	0	1	2	1
P2	4	0	0	3
P3	1	2	1	0
P4	1	0	3	0

Answer the following questions using banker's algorithm:

a) Calculate the *Needs* matrix:

Needs				
	RA	RB	RC	RD
P0				
P1				
P2				

P3				
P4				

b) Is the system in a safe state? If so, show a safe order in which the processes can run.
c) Can a request of one instance of RA by Process P0 be granted safely according to Banker's algorithm? Why/Why not?

2. At an instant, the resource allocation state in a system is as follows:
   4 processes P1–P4
   4 resource types: R1–R4
   R1 (5 instances), R2 (3 instances), R3 (3 instances), R4 (3 instance)
   Snapshot at time T0:

	Allocation				Request				Available			
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
P1	0	0	1	0	2	0	0	2	2	1	1	2
P2	2	0	0	1	1	3	0	1				
P3	0	1	1	0	2	1	1	0				
P4	1	1	0	0	4	0	3	1				

Run the deadlock detection algorithm and test whether the system is deadlocked or not. If it is, identify the processes that are deadlocked