CS 420
HOMEWORK ASSIGNMENT H4

1. Safe States

Assume one computer system has several concurrent processes and multiple instances of one resource used by these processes. For each of the following snapshots of a state of resource usage, identify if the system is in a "safe" state or an "unsafe" state. If it is a safe state, show one safe sequence, if it is in an unsafe state, show a sequence of execution that could result in deadlock. **(Show all your work and calculations)**

Snapshot 1 – 12 resource instances total

Process	Max Need	Allocated	Claimed
P_1	4	1	3
P_2	6	4	2
P_3	8	5	3
P_4	2	0	2

Snapshot 2 – 12 resource instances total

Process	Max Need	Allocated	Claimed
P_1	4	1	3
P_2	6	4	2
P_3	8	6	2
P_4	2	0	2

Snapshot 3 – 12 resource instances total

Process	Max Need	Allocated	Claimed
P_1	10	8	2
P_2	5	2	3
P_3	3	1	2

2. One method for denying the "wait-for" condition needed for deadlock requires that processes must request all of the resources they will need before the system may let them proceed. The system grants resources on an "all-or-none" basis. Discuss the pros and cons of this method.

3. A system has three processes and four identical resources. Each process requires at most two of the resources at any given time.

a. Can deadlock occur in this system? Explain.

b. If there are *m* processes, and each could request up to *n* resources, how many resources must be available in the system to ensure that deadlock will never occur?

c. If there are *m* processes and *r* resources in the system, what maximum number of resources, *n*, could each process request, if all processes must have the same maximum?

General Instructions:

- Show all your work and calculations. Only partial credit will be given if only final answer is written!
- Homework submissions will be clearly marked with the student's name, date and assignment identification at the top of the first page.
- All homework is to be completed by each student individually and represent that student's original, unassisted work. Any material copied in any way from other sources must be clearly identified and attributed.
- Each student's homework submission must be submitted at the start of class on the due date. Any work submitted late, but before 5:00 pm on the day following the due date will receive a 25% late-submission deduction on the graded score for the assignment. No credit for the assignment will be given when submitted after the late-submission deadline.