COMP SCI 3004 Operating Systems

Tutorial 6

1. Consider the traffic deadlock depicted in Figure 7.8.

a. Show that the four necessary conditions for deadlock indeed hold in this example.

b. State a simple rule that will avoid deadlocks in this system.

2. Consider a system consisting of four resources of the same type that are shared by three processes, each of which needs at most two resources. Show that the system is deadlock-free. How can you extend this to the general case of m resources and n processes?

3. Consider the following snapshot of a system:

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P_0	0 0 1 2	0 0 1 2	1 5 2 0
P_1	1 0 0 0	1 7 5 0	
P_2	1 3 5 4	2 3 5 6	
P_3	0 6 3 2	0 6 5 2	
P_4	0 0 1 4	0 6 5 6	

Answer the following questions using the banker's algorithm:

a. What is the content of the matrix $Need$?

b. Is the system in a safe state?

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

4. Suppose that you have coded the deadlock-avoidance safety algorithm and now wish to implement the deadlock-detection algorithm. Can you do so by simply using the safety algorithm and redefining $Max_i = Waiting_i + Allocation_i$, where $Waiting_i$ is a vector specifying the resources process i is waiting for, and $Allocation_i$ is as defined in Section 7.5? Explain your answer.