Assignment6

Please write your student number and name in the assignment when submit it.

1. Consider the traffic deadlock depicted in Figure 1.
   a. Show that the four necessary conditions for deadlock indeed hold in this example.
   b. State a simple rule for avoiding deadlocks in this system.

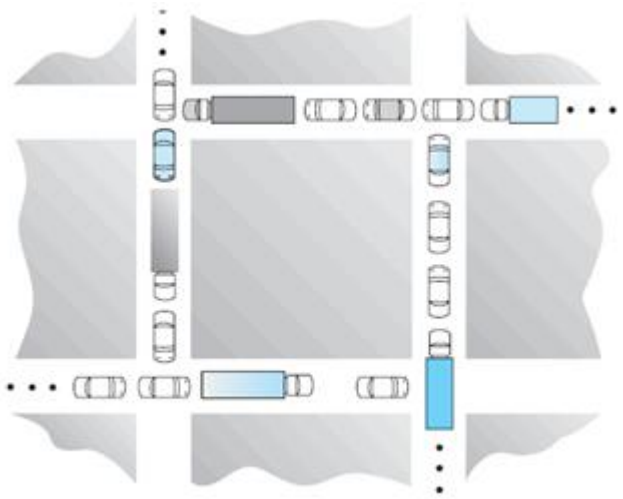

Figure 1. Traffic deadlock

2. Consider a system consisting of m resources of the same type being shared by n processes. A process can request or release only one resource at a time. Show that the system is deadlock free if the following two conditions hold:
   a. The maximum need of each process is between 1 and m resources
   b. The sum of all maximum needs is less than m + n

3. Consider the following snapshot of a system:

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

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

4. Consider the following snapshot of a system:

	Allocation	*Max*	*Available*
	A B C D	*A B C D*	*A B C D*
T_0	3 1 4 1	6 4 7 3	2 2 2 4
T_1	2 1 0 2	4 2 3 2	
T_2	2 4 1 3	2 5 3 3	
T_3	4 1 1 0	6 3 3 2	
T_4	2 2 2 1	5 6 7 5	

Answer the following questions using the banker's algorithm:

a. Illustrate that the system is in a safe state by demonstrating an order in which the threads may complete.

b. If a request from thread T_4 arrives for (2, 2, 2, 4), can the request be granted immediately?

c. If a request from thread T_2 arrives for (0, 1, 1, 0), can the request be granted immediately?

d. If a request from thread T_3 arrives for (2, 2, 1, 2), can the request be granted immediately?