TUTORIAL SIX

Deadlocks

1. Indicate whether the following statements are true or false. Justify your answers.

   (a) In the dining-philosopher problem with five philosophers, if we allow at most four of them to be hungry simultaneously, deadlock may still occur.

   (b) It is impossible to have a deadlock involving only one single process.

   (c) If a resource allocation graph contains a cycle, then a deadlock has occurred.

2. Use resource-allocation graphs to model the following situations, and determine if deadlock occurs in each case. There are three resource types, R, S, and T, each having a single instance.

Case 1	Case 2
P1 requests R	P1 requests R
P2 requests T	P2 requests T
P1 requests S	P1 requests S
P2 requests S	P2 requests S
P1 releases R	P1 requests T
P1 releases S	

3. A resource-allocation state is given below. Assume Available = 2.

	Allocation	Max	Need
PROCESS 1	1	6	5
PROCESS 2	1	5	4
PROCESS 3	2	4	2
PROCESS 4	4	7	3

   (a) If PROCESS 4 requests for one more unit of the resource, does this lead to a safe state or an unsafe one?

   (b) If PROCESS 3 requests for one more unit of the resource, does this lead to a safe state or an unsafe one?

4. Consider the following snapshot of a system's state, with four processes (P0, P1, P2 and P3) and three resource types (A, B and C). The current Allocation, Need and Available matrices are shown in the below table. Compute the minimum value for x, so that this system state is safe. Justify your answer.

		Available
		A B C
		0 1 x
Process	Allocation	Need
	A B C	A B C
P0	2 1 1	0 1 0
P1	1 1 0	2 1 2
P2	1 1 1	2 0 1
P3	1 1 1	4 1 0