Deadlock Practice Questions

1. Considering a system with five processes P_0 through P_4 and three resources types A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances. Suppose at time t_0 following snapshot of the system has been taken:

Process	Maximum Need			Allocation		
	A	B	C	A	B	C
P0	7	5	3	0	1	0
P1	3	2	2	2	0	0
P2	9	0	2	3	0	2
P3	2	2	2	2	1	1
P4	4	3	3	0	0	2

   a. Find the Need Matrix?
   b. Find whether system is in Deadlock or not? Write the safe sate (if Possible)
   c. What will happen if process P_1 requests one additional instance of resource type A and two instances of resource type C? Is additional request by process P1 granted?

2. **Consider the snapshot of the system and solve the following using Banker's Algorithm.**

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

   i. Obtain the array 'Need'.
   ii. Is the system in a safe state?
   iii. If a request from process p1 arrives for (0,4,2,0) can the request be immediately granted?

3. A computer system has 6 tape drives, with n processes competing for them. Each process may need 3 tape drives. What is the maximum value of n for which the system is guaranteed to be deadlock? Justify your answer.

4. Write the possible protocols to prevent "**Hold and Wait**" and "**Circular Wait**" condition for Deadlock Prevention? Clearly Explain!

5. Draw the resource allocation graph and determine deadlock or deadlock free state.

   $P = \{P_1, P_2, P_3\}$

   $R = \{R_1, R_2, R_3, R_4\}$

   $E = \{ P_1 \rightarrow R1, P2 \rightarrow R3, R1 \rightarrow P2, R2 \rightarrow P2, R2 \rightarrow P1, R3 \rightarrow P3, P3 \rightarrow R2\}$

   There are ONE, TWO, ONE and THREE instances of R_1, R_2, R_3 and R_4 type resources

6. An OS contains 3 resource classes. The number of resource units in these classes is 7,7,10 respectively. The Current resource allocation is shown below :

	Allocated Resource			Maximum Requirement		
	R1	R2	R3	R1	R2	R3
P1	2	2	3	3	6	8
P2	2	0	3	4	3	3
P3	1	2	4	3	4	4

       a) Is the current allocation state safe ?
       b) Would the following request be granted in current state
           i)   Process P1 request (1,1,0)
           ii)   Process P2 request (0,1,0)
           iii)   Process P1 request (0,1,0)

7. Draw the resource allocation graph and determine deadlock or deadlock free state.

$P = \{P_1, P_2, P_3\}$

$R = \{R_1, R_2, R_3, R_4\}$

$E = \{ P_1 \rightarrow R1, P2 \rightarrow R3, R1 \rightarrow P2, R2 \rightarrow P2, R2 \rightarrow P1, R3 \rightarrow P3, P3 \rightarrow R2\}$

There are ONE, TWO, ONE and THREE instances of R_1, R_2, R_3 and R_4 type resources

8. Consider the snapshot of the system and solve the following using Banker's Algorithm

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P0	6 0 1 2	4 0 0 1	3 2 1 1
P1	2 7 5 0	1 1 0 0	
P2	2 3 5 6	1 2 5 4	
P3	1 6 5 3	0 6 3 3	
P4	1 6 5 6	0 2 1 2	

Using Banker's algorithm, answer the following questions:-

    i.   How many resources of type A, B, C, D are there?
    ii.   What are the contents of need matrix?
    iii.   Find if the system is in safe state? If it is, find the safe sequence.