CSE 4049: Design of Operating Systems

ASSIGNMENT 4:

This assignment is designed to give you practice with concepts of

- Deadlocks and methods of handling deadlock

1. Consider a system with four processes P1, P2, P3, P4 and 4 resource types R,R2,R3,R4 each one with a single instance. Draw the resource allocation graph corresponding to following resource allocation state:
   - P1 requests for R3 and R1.
   - P2 holds R3 and requests for R1
   - P3 holds R2 and requests for R4
   - P4 holds R1 and requests for R2

   Using wait for graph, check whether the system is in deadlock or not? If so how many processes are involved in deadlock?

2. Consider a system with 12 tapedrives and 3 processes: P0, P1,P2. P0 requires 4 tape drives, P1 requires 10 tapedrives, P2 requires 9 tapedrives for completing their task. Suppose at time t0, P0 is holding 2 tapedrives, P1 is holding 5 tapedrives and P2 is holding 2 tape drives. Then check whether the current resource allocation state is safe or not. If yes specify the safe sequence.

3. Consider a system has 10 units of a resource type and 5 processes. The current resource allocation state is given as follows:

Process	**Used**	**Max**
P0	2	5
P1	1	6
P2	2	6
P3	1	2
P4	1	4

   If P_2 will request for 2 more instances of the same resource type, check the request can be granted immediately or not?

4. Consider a system with two resources, A, and B. A has 6 instances and B has 3 instances. Can the system execute the following processes without any deadlock? If yes specify the safe sequence.

Process	Allocation		Max	
	A	B	A	B
P0	1	1	2	2
P1	1	0	4	2
P2	1	0	3	2
P3	0	1	1	1
P4	2	1	6	3

5. Consider the following resource allocation state with 3 processes and 3 resources:

	Allocation			Max		
	X	Y	Z	X	Y	Z
P_0	0	0	1	7	4	3
P_1	3	2	0	6	2	0
P_2	2	1	1	3	3	3

There are 3 instances of type X, 2 instances of type Y and 2 instances of type Z still available.

a) Find the content of the need matrix.
b) Is the system in a safe state?
c) If P_0 will request for 2 more instances of type Z, Can the request be granted immediately or not?

6. Consider the following resource allocation state with 4 processes and 4 resources, and an available vector of <0100>.

	Allocation				Request			
	A	B	C	D	A	B	C	D
P_0	0	1	1	0	0	0	1	0
P_1	0	1	0	1	1	0	0	1
P_2	1	2	0	0	0	0	0	1
P_3	0	0	1	2	0	0	0	0
P_4	1	0	1	0	0	1	0	0

a) Find the initial number of instances available for each resource type.
b) Check whether the system is deadlock free or not.
c) If P_0 is assigned with 1 more instance of type B, then check whether the system is deadlock free or not.