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Subject : Operating Systems

Assignment : 3 Problems on Deadlock Avoidance

Q1. For the given data, find the safe sequence

Process	Allocation	Need	Available
P0	5	10	3
P1	2	4	
P2	2	9	

Solution:

a. At time t0, for P1, Need - Allocation = 4 - 2 = 1 < Available (3)
b. Therefore 2 resources are allocated to P1 and it is included in the safe sequence
c. After P1 is completed, the acquired resources are returned, thus the data is as follows -

Process	Allocation	Need	Available
P0	5	10	5
P2	2	9	

d. At time t1, for P0, Need - Allocation = 10 - 5 = 5 = Available (5)
e. Therefore 5 resources are allocated to P0 and it is included in the safe sequence.
f. After P1 is completed, the acquired resources are returned, thus the data is as follows

Process	Allocation	Need	Available
P2	2	9	10

g. At time t2, for P2, Need - Allocation = 7 < Available (10)
h. Therefore, 7 resources are allocated to P2 and it is included in the safe sequence.
i. After P2, is completed, the acquired resources are returned, thus the data is as follows -

Available
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j. Thus the final safe sequence is <P1, P0, P2>

Q2. Consider the following data and answer the questions mentioned below.

Process	Maximum			Allocated			Available		
	A	B	C	A	B	C	A	B	C
P1	0	0	1	0	0	1			
P2	1	7	5	1	0	0			
P3	2	3	5	1	3	5			
P4	0	6	5	0	6	3			
Total				2	9	9	1	5	2

a. How many resources of type (A, B, C)?
Ans. Resources = Total + Available
= (3, 14, 11)

b. What is the content of the Need matrix?

Ans.

Process	Need		
	A	B	C
P1	0	0	0
P2	0	7	5
P3	1	0	0
P4	0	0	2

c. Is the system in a safe state? Why?

Ans. Yes, because the processes can be executed in the sequence P1, P3, P2, P4, even if each process asks for its maximum number of resources when it executes

Q3. If a request from process P1 arrives for additional resources (0, 5, 2), can the Banker's algorithm grant the request immediately ?
What would be the new system state after allocation?

Process	Maximum			Allocated			Need			Available		
	A	B	C	A	B	C	A	B	C	A	B	C
P1	0	0	1	0	0	1	0	0	0			
P2	1	7	5	1	0	0	0	7	5			
P3	2	3	5	1	3	5	1	0	0			
P4	0	6	5	0	6	3	0	0	2	1	5	2

Ans.

a. Here, the final available resources, before the new allocation of P1 are (1, 5, 2).
b. Since P1 has arrived with a request of (0, 5, 2) and (0, 5, 2) < (1, 5, 2), hence P1 will be granted instantly.
c. The sequence, <P1, P3, P2, P4> will satisfy the new allocation.