Bài 1:

Bài 2:

Bài 4:

m Resources – 4 Processes

1 Process needs at most 3 Resouces

* In the worst situation, each process holds 2 and waits for 1 resource
* Min number of R = 8 => Deadlock
* 8 + 1 = 9 R => No deadlock

Key: Min value of m : 9 Resources -> No deadlock

Bài 7a:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Allocation | | | | | Max | | | | | Need (Max – Allocation) | | | | |
|  | R1 | R2 | R3 | R4 | R5 | R1 | R2 | R3 | R4 | R5 | R1 | R2 | R3 | R4 | R5 |
| P1 | 2 | 3 | 3 | 1 | 1 | 4 | 5 | 7 | 1 | 1 | 2 | 2 | 4 | 0 | 0 |
| P2 | 1 | 0 | 2 | 1 | 4 | 2 | 2 | 3 | 1 | 5 | 1 | 2 | 1 | 0 | 1 |
| P3 | 5 | 2 | 2 | 2 | 2 | 5 | 3 | 7 | 2 | 3 | 0 | 1 | 5 | 0 | 1 |
| P4 | 4 | 1 | 0 | 1 | 0 | 5 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 2 |
| P5 | 1 | 1 | 3 | 1 | 1 | 4 | 5 | 3 | 1 | 1 | 3 | 4 | 0 | 0 | 0 |

Bài 7b:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Available | | | | |  |
| R1 | R2 | R3 | R4 | R5 |  |
| 3 | 2 | 2 | 1 | 1 |  |
| 8 | 3 | 4 | 3 | 5 | P2, P4 finish |
| 10 | 6 | 7 | 4 | 6 | P1 finish |
| 16 | 9 | 12 | 7 | 9 | P3, P5 finish |

The system in a safe state

Possible safe sequences : (P2, P4, P1, P3, P5), (P2, P4, P1, P5, P3),..