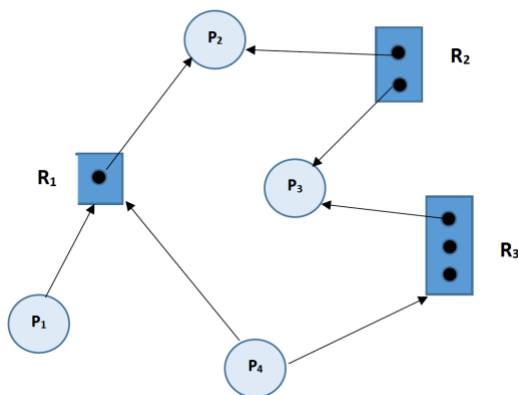# Review Questions – Deadlocks (Chapter 8)

## Operating Systems SFWRENG 3SH3 Term 2, Winter 2023
Prof. Neerja Mhaskar

**Questions:**

1. Consider the below resource allocation graph. Is the system in a deadlock state? If so, report the cycle(s) causing deadlock. If not, explain <span style="color:red">the order in which processes access the resources requested</span> and complete execution.



2. Consider the below resource allocation graph. Is the system in a deadlocked state? If so, report the cycle(s) causing deadlock. If not, explain <span style="color:red">the order in which processes access the resources requested</span> and complete execution.
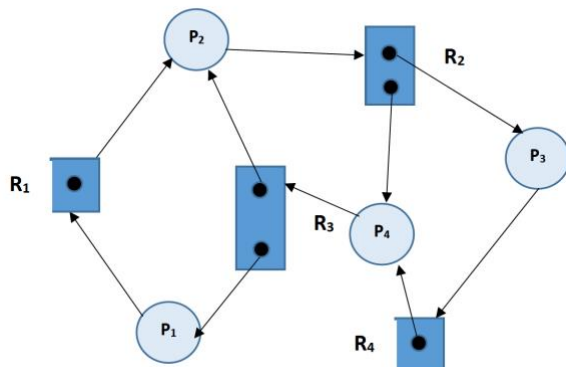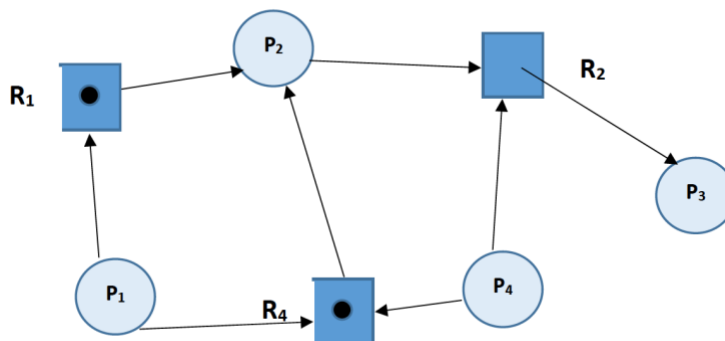


3. Consider the following snapshot of a system:

| | Allocation | Max | Available |
|---|---|---|---|
| | A B C D | A B C D | A B C D |
| $P_0$ | 0 0 1 2 | 0 0 1 2 | 1 5 2 0 |
| $P_1$ | 1 0 0 0 | 1 7 5 0 | |
| $P_2$ | 1 3 5 4 | 2 3 5 6 | |
| $P_3$ | 0 6 3 2 | 0 6 5 2 | |
| $P_4$ | 0 0 1 4 | 0 6 5 6 | |

Answer the following questions using the banker's algorithm:

a. What is the content of the matrix Need?
b. Is the system in a safe state?
c. If a request from process $P_1$ arrives for (0,4,2,0), can the request be granted immediately?

4. Consider the below resource allocation graph. Construct the corresponding wait-for graph. Is the system in deadlock? If so, provide the cycle causing deadlock.



5. Consider the following snapshot of a system at time *T0*:

Five processes **P0** through **P4**.

Three resource types A (10 instances), B (3 instances), and C (6 instances)

Snapshot at time **T0**:

| | Allocation | Request | Available |
|---|---|---|---|
| | A B C | A B C | A B C |
| P0 | 2 1 1 | 0 0 0 | 0 0 0 |
| P1 | 2 1 2 | 2 0 2 | |
| P2 | 4 0 0 | 0 0 1 | |
| P3 | 2 1 1 | 1 0 0 | |
| P4 | 0 0 2 | 0 0 2 | |

a) Is the system in deadlocked state? If no, provide a sequence of processes satisfying the safety requirement. If yes, explain why and list the processes involved in the deadlock.

b) Suppose process P1 makes an additional request of resource type B, the Request matrix is modified as follows:

| | *Request* |
|---|---|
| | *A B C* |
| $P_0$ | 0 0 0 |
| $P_1$ | 2 1 2 |
| $P_2$ | 0 0 1 |
| $P_3$ | 1 0 0 |
| $P_4$ | 0 0 2 |

c) Is the system in deadlocked state? If no, provide a sequence of processes satisfying the safety requirement. If yes, explain why and list the processes involved in the deadlock.