

Problem 6.1

- (1) Mutual Exclusion: Only one car may move at a time.
- (2) Hold and Wait: Because only one car may move at a time, the other cars must wait. Because no car can go first, they must all wait.
- (3) Preemption: There is no light to tell which car to go first.
- (4) Circular Wait: All four cars arrived at the same time, so no car has the right of way.

Problem 6.2

Inserting a round-a-bout instead of a four-way-stop will both prevent and avoid the issue.

Problem 6.3

- (1) Q acquires B and then A and then releases B and A. When P resumes execution, it will be able to acquire both resources
- (2) Q acquires B and then A. P executes and blocks on a request for A. Q releases B and A. When P resumes execution, it will be able to acquire both resources.
- (3) Q acquires B and then P acquires A. P then releases A. Q acquires A and then releases B and A. When P resumes, it will be able to acquire both A and B.
- (4) P acquires A and Q acquires B. P then releases A and Q acquires A and then releases A. P resumes and gets and then releases B.
- (5) P Acquires A and then B. Q executes and blocks on a request for B. P releases A and B. When Q resumes execution, it will be able to acquire both resources.
- (6) P acquires A and then B and then releases A and B. When Q resumes execution, it will be able to acquire both resources.

Problem 6.4

If a process does not need a resource, it will let go of that resource such that two processes can't fight over it.

Problem 6.5

(1) True

<i>Process</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
<i>P0</i>	7	5	3	4
<i>P1</i>	2	1	2	2
<i>P2</i>	3	4	4	2
<i>P3</i>	2	3	3	1
<i>P4</i>	4	1	2	3
<i>P5</i>	3	4	3	3

Homework: Self-study 6.6 and discuss in detail how the first solution leads to a deadlock, while the second prevents it from happening.

In the first solution, there is no mutual exclusion, preemption or circular wait. Each philosopher can take more than one fork and they can all take a fork at once. This will lead to dead lock most of the time. The second solution provides that there are an abundance of resources, or that there is a limit on the amount of philosophers (processes) that can be at the table.