

Key

Name: _____ Course (410 or 689): _____

This quiz is closed book and closed notes

Question 1: What are the three requirements that must be satisfied by a solution to a critical-section problem?

1. Mutual exclusion
2. Progress
3. Bounded waiting

Question 2 Define the term “race condition”.

The situation where several threads access and manipulate the same data concurrently and where the outcome of the execution depends on the particular order in which the access takes place.

Question 3 One of the necessary conditions for deadlock is “hold-and-wait”. What is “hold-and-wait”? Give an example of a protocol that can be used to ensure that this condition never occurs in the system.

Hold and wait: there must exist a process that is holding at least one resource and is waiting to acquire additional resources that are currently being held by other processes.

To ensure that the hold and wait condition never occurs in the system, we must guarantee that whenever a process requests a resource, it does not hold any other resources. One way is to make the process perform all requests at the same time. Another is to make the process release all resources before making a new request.

Question 4: Given a resource-allocation graph with several instances of each resource type, is a cycle a necessary condition for the existence of a deadlock? Is the cycle a sufficient condition? Explain why in both cases.

A cycle is a necessary condition because circular wait is a necessary condition.

A cycle is not a sufficient condition because subsequent actions by processes may remove the dependency that caused the circular wait.

Question 5: Draw a resource allocation graph encoding the following specification: three processes (P1, P2, P3) and two resources (R1 and R2). Two instances of R1 and one of R2. Successful requests have been made by P1 for one instance of R1 and one instance of R2. Process P2 is requesting, but has not yet been granted, an instance of R2.

