CS550 Comparative Operating Systems
Spring 2001, Dr. Xian-He Sun
Exam #2 (April 16, 2001)

Name:_____ (Last, First)

Score:_____ (100 pts.)

Make sure there are seven problems on five pages. Read each problem very carefully before answering it. Try to make your answers short and clear.

1. Give a brief answer for each of the questions:

   (a) What are the two major objectives of process scheduling?

   (b) List the three different models of speedup

   (c) Give the four major components of a file system (15 pts.)

   The primary objective is to enhance overall system performance and the second objective is to achieve location and performance transparencies.

   The three different models of speedup are fixed-size speedup, fixed-time speedup, and memorey-bounded speedup.

   The four major components of a file system are (p194): directory service, authorization service, file service (transaction and basic), and system service.

2. What is the difference between name resolution and address resolution? (10 pts.)

   (p128)
   Names are application-oriented denotations of objects. Addresses are object representations that carry some structural information relevant to the operating system for managing and locating an object. The name resolution process maps names to addresses.

   Address resolution maps addresses to routes that show how an object can be physically located.

   eitem Define the terms of *remote access*, *cache access*, and *download/upload access*. Give the relation between these three accesses and overlapping access. (10 pts)

   remote access: No file data is kept in the client machine. Each access request is transmitted directly to the remote file server through the underlying network.
   cache access: A small part of the file data is maintained in a local cache. A write operation or cache miss results a remote access and update of the cache.

download/upload access: The entire file is downloaded for local accesses. A remote access or upload is performed when updating the remote file.

The first approach is a single-level access model, while the others are a two-level hierarchical storage representation.

3. Write a pseudo code semaphore solution for the producer/consumer problem implementing pipes. (15 pts)

   Ex. 4.5 Homework, a classical bounded-buffer problem.

4. Given Figure 4.16 for the two-phase commit atomic transaction protocol. Describe the designed recovery action and how to achieve it if a participant crashes between precommit and commit.

   The recovering participant must determinine whether the transaction was committed or aborted by contacting the coordinator or the other participants.

5. A instance of the logical tree structure for the token-bassed mutual exclusion protocol is shown in Figure 4.24. All requests are empty and the token is at node 1. At this moment, requests to claim the token come every one unit time apart in the order of (7,5,3,1,6,4,2). Assume that the communication delay between each pair of nodes is also one-unit time and each request use the critical section for two units of time. Show the distribution of the request queue at each node after node 3 has claimed the token and has been in its critical section for one unit of time. What is the order of execution sequence? (20 pts.)

6. Consider the task set {(1,4), (2,5), (3,12)}

   (a) Compute the response time of each task under RM scheduling. Does the task set have a feasible static priority assignment?

   (b) Compute the load of the task set.

   (c) Show the EDF schedule of the task set at the critical instant of the task set. (20 pts)

   Ex 5.13