

**August 2007
Preliminary Exams**

Computer Operating Systems (Questions 1-4)

Problem 1

Motivate remote procedure calls (RPC). Explain what marshaling of parameters is. Describe what difficulties RPC implementers encounter when parameters are passed by reference and how these difficulties are dealt with.

Problem 2

Define Shortest Job First (SJF) and Shortest Remaining Time (SRT) process scheduling disciplines. Define process starvation in the context of CPU scheduling. Is process starvation possible for one of these disciplines? For each discipline: if the answer is "no", explain the reasons why not, if "yes", give a starvation example and describe how a process may be starved. Describe how process starvation is avoided in a multilevel process scheduling queue.

Problem 3

A resource map kernel buffer memory allocation technique keeps a separate record of each gap (unallocated space) in the form

<start of the free segment, segment size>

Explain the disadvantages of this method of kernel memory maintenance. Describe either power-of-two or buddy kernel memory allocation and explain how this method overcomes the disadvantage of the resource map.

Problem 4

In modern filesystems a certain area on a disk is allocated to a "journal". Rather than update the filesystem data and metadata (directory entries, pointers, free list updates) immediately, the updates are written into a journal. Since the file system is not updated, the information in it becomes stale. Explain how the OS overcomes this problem and discuss the advantages of journaling.

