

CS 6210 - Midterm – Oct. 2001**Closed book and closed notes****Your Name:** _____

Prof. Schwan

Please make time to work on each question in this exam. Partial credit will be given whenever possible.

1) Short questions: 30 mins. (questions marked with * have more weight)

- a. *Provide two examples of functionality placed into the kernel that result in improved performance. Be concrete and briefly argue why performance is improved for each example.

- b. Describe what is meant by the term 'safety' in SPIN vs. in Exokernel.

- c. *Sketch pseudo-code that uses OAM (Optimistic Active Messages) to remotely call some procedure. Discuss the applicability of OAM to improve the performance of accesses to web pages.

d. *Describe the difference between the work-conserving and non-work-conserving models presented in the 'Cache Affinity' paper. Discuss (!) the different results attained by these two models.

e. *Assuming that a NIC (network interface card) does not have any DMA hardware, answer the following: (1) what is the effect of co-scheduling the NIC's actions with those of the host CPU (i.e., making sure the host's driver runs at the same time the NIC is executing), and (2) for what kinds of application needs is such co-scheduling most appropriate?

2) Medium Length Question (25 mins.):

Sketch the pseudo-code and data structures for a 'scheduler activation' that would always force two threads to run in parallel, one on the communication co-processor (NIC), the other on the host processor. Make sure that they really DO RUN IN PARALLEL, that is, one thread does not run unless the other one does. The idea, of course, is to permit a single process to continuously push out or pull in data at a very high rate, without possible waits on other processes.

Proceed as follows:

- a) describe your new 'scheduler activation'
- b) sketch how it works, assuming, of course, that your NIC is fully programmable
- c) give two reasons/circumstances under which it works well
- d) identify two specific hardware/kernel reasons for why it may not work well