

**Midterm**  
**April 7, 2006 10.40–12.30**  
**Good Luck!**

**Part A. Short Answer, answer the questions with one or two sentences (each 5 pt)**

1. Discuss and compare

- i Single Programming,
- ii Pure Multiprogramming,
- iii Multiprogramming.

2. What is the purpose of the command interpreter? Why is it usually separate from the kernel?

3. For each of the following system calls, give a condition that causes it to fail: **fork** and **exec**.

4. A computer has six tape drives, with  $n$  processes competing for them. Each process may need two drives. For which value of  $n$  is the system deadlock free?



processes are running on a shared-memory multiprocessor, that is, two CPUs, sharing a common memory?

10. What is meant by the term *context switch*? What might cause a context switch to occur?

11. What is starvation, give an example?

12. Three jobs (A, B, and C) arrive to the job scheduler at time 0. Job A needs 10 seconds of CPU time, Job B needs 20 seconds, and Job C needs 30 seconds.

a What is the average turnaround time for the jobs, assuming a shortest-job-first (SJF) scheduling policy?

b What is the average turnaround time assuming a longest-job-first (LJF) policy?

c Which finishes first, Job C in SJF or Job A in LJF?

good performance from this algorithm.

14. Describe four ways to *prevent* deadlock by attacking the conditions required for deadlock.

15. **The Readers and Writers Problem** models access to a database with many competing processes wishing to read and write it. It is acceptable to have multiple processes reading the database at the same time, but if one process is updating (writing) the database, no other processes may have access to the database, not even readers. Write pseudo code to coordinate the readers and writers.

Hints: Need a global counter, **rc**, for the number of processes reading or wanting to. Use 2 semaphores - one for controlling access to **rc**, one for controlling access to the database.