Ceng 328 Operating Systems
Midterm
July 28, 2009 10.40–12.30
Good Luck!

Answer all of the questions.

1. (5 pts) What are the two main purposes of an operating system?

2. (5 pts) You are supposed to design a highly reliable operating system. What is meant by "reliable"? Which criteria and measures should be taken care?

3. (10 pts) What is multiprogramming? Describe and compare single programming and pure multiprogramming. What is thrashing?

4. (10 pts) What is the purpose of system calls? For each of the following system calls, give a condition that causes it to fail: **fork** and **exec.**

5. (10 pts) What is a Critical Region? List and explain the four conditions that need to be satisfied to solve the critical-region problem?

6. (10 pts) In the solution to the dining philosophers problem, why is the state variable set to **HUNGRY** in the procedure *take_forks*?

7. (15 pts) Consider the following sets of processes, with the length of the CPU-burst time given in milliseconds. Arrival time is the time at which the process is added to the ready queue.

Process	Burst Time	Arrival Time
P1	30	0
P2	15	0
P3	9	0
P4	12	0
P5	6	12
P6	3	18

   i Draw appropriate charts illustrating the execution of these processes using FCFS, SJF non-preemptive, and SJF preemptive.

ii Calculate the wait times of each process for each strategy. Calculate the *average* wait times under each strategy.

Process	**FCFS**	**SJF-nonpre**	**SJF**
P1			
P2			
P3			
P4			
P5			
P6			
Average:			

8. (10 pts) A computer uses the relocation scheme of base-limit pair. What are the problems with such a protected system (compared to a paged or segmented system)? A program is 10000 bytes long and is loaded at address 40000. What values do the *base* and *limit* register get according to the scheme?

9. (10 pts) Describe internal and external fragmentation and explain the difference between them. Which one(s) occurs in paging systems? Which one(s) occurs in systems using pure segmentation? Explain.

10. (20 pts) What is the memory management unit (MMU) and what does it do? Illustrate the internal operation of the MMU with 8 8-KB pages.