

178 330 Operating Systems
Midterm Examination
4 January 2007 21.00 – 24.00

Instructions:

1. Books are NOT ALLOWED.
 2. A single sheet of A4 note is ALLOWED.
 3. There are 11 questions, 90 marks total, attempts ALL questions.
 4. Do NOT cheat.
-

1. Why does an operating system exist ? What is the primary purpose of an operating system ? (5 marks)
2. Why is CPU scheduler a short-time scheduler ? (5 marks)
3. What are differences between *monolithic kernel* and *microkernel* ? Which one is better ? Why ? (5 marks)
4. What are *system call*, *user space*, and *kernel space* ? What are relationships among them ? (5 marks)
5. Describe states of a process, and how can a process transit from one state to another ? (5 marks)
6. What are differences among a *process*, a *thread*, and a *fiber* ? (5 marks)
7. How can a uniprocessor system with Intel® Hyper-Threading Technology provides an illusion of dual processors? How can an operating system take advantages of such technology ? (10 marks)
8. In the process state cycle, there are 4 possible transitions to perform CPU scheduling. What are those transitions ? Why some of them are preemptive, while the others are non-preemptive ? (10 marks)
9. From the following processes:

Process	Burst time	Arrival time	Priority
P0	5	0	5
P1	7	1	4
P2	3	2	3
P3	9	3	2
P4	1	5	1
- 9.1 Find *average waiting time* of non-preemptive SJF, RR with time quantum = 2, and non-preemptive priority scheduling (a higher number implies a higher priority). (10 marks)
- 9.2 Find *average turnaround time* of FCFS and preemptive SJF scheduling (10 marks)
10. Describe how the Linux scheduler works and clearly show why such scheduler has algorithm complexity of $O(1)$. (10 marks)
11. If you are going to design an operating system for industrial robots, what is your choice of the following, and why ? (10 marks)
 1. Monolithic or Microkernel ?
 2. Time sharing or Real-time ?
 3. Preemptive or Non-preemptive ?
 4. Thread model of M:1, 1:1, M:N ?
 5. Preemptible kernel or Non-preemptible kernel ?