178 330 Operating Systems
Midterm Examination
7 January 2010 16:00 – 19:00

Instructions:
1. NO books, NO sheets, NO calculators are allowed.
2. There are 18 questions, 70 marks total, attempts ALL questions.
3. Answer in the space provided ONLY.
4. Do NOT cheat. Any attempts to cheat will result in dismissal from class with an "F" grade.

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1. Why do we need an *operating system* ? Is it possible to build a computing system without an operating system ? Why ? (3 marks)

2. An operating system is responsible for managing and providing four main services. What are those services ? Describe primary functions of each service. (3 marks)

3. What are differences between the *multiprogramming* and the *time sharing* ? (3 marks)

4. What are *system calls* ? Why do we need system calls ? (3 marks)

5. What are differences between the *monolithic kernel* and the *microkernel* ? Which one is better ? Why ? (5 marks)

6. In x86 systems, why ROM BIOS must be mapped into the main memory space ? (3 marks)

7. Why most of x86 boot loaders must be divided into *first-stage* and *second-stage* ? (3 marks)

8. What are *interrupts* ? How can an operating system handle those interrupts ? (5 marks)

9. There are many types of interrupts, what are they ? What are differences between them ? (5 marks)

10. What is a process ? What are differences between a process and a program ? (3 marks)

11. Explain process states and transitions (5 marks)

12. Suppose the process *P* executes the following code without any error

```
x = fork();
y = fork();
```

Draw the process tree showing parent-child relationship among them, and determine *x* and *y* in each process. (5 marks)

13. What are *threads* ? What are advantages and disadvantages of threads compared to processes ? (3 marks)

14. What are *fibers* ? What are advantages and disadvantages of fibers compared to threads ? (3 marks)

15. What are differences between the *kernel threads* and the *user threads*? (3 marks)

16. Which one, between the kernel thread and the user thread, is faster? Why ? (5 marks)

17. In which conditions that the kernel thread is better than user threads ? Why ? (5 marks)

18. In which conditions that the M-1 thread model is better than any other thread models ? Why ? (5 marks)