Name:_____ID:_____

178 330 Operating Systems
Midterm Examination
19 January 2008 14.30 – 17.30

Instructions:
1 NO materials are ALLOWED.
2 There are 7 questions, 90 marks total, attempts ALL questions.
3 Do NOT cheat.

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1 True or False, and Why ? (Correct 2 marks, Incorrect -2 marks, Incomplete -5 marks)
   1.1 _____All computer systems need an operating system
      Why ?

   1.2 _____Microkernel is more expandable than monolithic kernel
      Why ?

   1.3 _____Microsoft Windows XP is an operating system
      Why ?

   1.4 _____Multiprogramming is a technique to run multiple programs at the same time.
      Why ?

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2 Processes

2.1 Describe states of a proces ? In which situations a state would transit from one state to another ?(10 marks)

2.2 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 ? (5 marks)

3 *User space* and *Kernel space* (10 marks)
    3.1 What are *user space* and *kernel space*?

    3.2 What are benefits of splitting processing to user space and kernel space ?

    3.3 How can a process in user space enter kernel space ?

4 What are differences among a *process*, a *thread*, and a *fiber* ? (5 marks)

5 From the following processes:

Process	Burst time	Arrival time	Priority
P0	3	0	2
P1	1	1	3
P2	5	2	1
P3	7	3	2
P4	9	1	3

5.1 Find *average waiting time* of non-preemptive SJF, RR with time quantum = 2, and non-preemptive priority scheduling (a larger number implies higher priority). (15 marks)

5.2 Find *average turnaround time* of FCFS and preemptive SJF scheduling (15 marks)

6 Linux's Completely Fair Scheduler (10 marks)
   6.1 What does fairness in CFS mean ?

   6.2 Compare CFS to the Linux O(1) scheduler in term of data structure, algorithms, and
       completely

7 A digital audio workstations is capable to record 24 audio tracks at the same time and it must
   process all the tracks to deliver high quality audio at 96 kHz. What is your choice of the
   followings, and why ? (10 marks)
   7.1 Time sharing or Real-time ?

   7.2 Preemptive or Non-preemptive ?

   7.3 Thread model of M:1, 1:1, M:N ?

   7.4 Preemptible kernel or Non-preemptible kernel ?