國立臺灣師範大學 110 學年度碩士班招生考試試題

科目：計算機系統　　適用系所：資訊工程學系

注意：1.本試題共 2 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則依規定扣分。

1. (9 points) What are the three general methods used to pass parameters to operating systems during system calls?

2. (12 points) Consider the following processes. Determine the average waiting time of the execution for the following scheduling algorithms.

Process	CPU burst time	Arrival time
P1	1	0
P2	7	3
P3	9	4
P4	3	8
P5	5	9

   (1) (6 points) First-come first-serve scheduling
   (2) (6 points) Non-preemptive shortest-job-first scheduling

3. (5 points) Amdahl's Law is a formula that identifies potential performance gains from adding additional computing cores to an application that has both serial and parallel components. If S is the portion of the application that must be performed serially on a system with N processing cores, what is the maximum speedup?

4. (12 points) Assume that a disk drive has 1000 cylinders, numbered 0 to 999. The disk drive is currently serving a request at cylinder 50, and the previous request was at cylinder 850. Consider the following queue of pending requests in FIFO order.

   98 279 547 958 965 158 971 958 486 801

   Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for the following disk scheduling algorithms?
   (1) (6 points) FCFS scheduling
   (2) (6 points) SSTF scheduling

5. (12 points) Consider the following page reference string.

   2 5 10 8 10 7 1 9 10 7 8 8 4 7 2

   Assume that we use demand paging with four frames. How many page faults would occur for the following replacement algorithms?
   (1) (6 points) First-in, first out replacement
   (2) (6 points) Least recently used replacement

6. (15 points) Briefly explain the following different types of caches.
   (1) (5 points) direct mapped cache,
   (2) (5 points) fully associative cache,
   (3) (5 points) n-way set associative cache.

7. (15 points) Briefly explain the following different types of hazards for a pipelined CPU.
   (1) (5 points) data hazard,
   (2) (5 points) structural hazard,
   (3) (5 points) control hazard.

8. (20 points) 選擇題，共有五題，每題都為單選題，請將答案寫在答案卷上。
   (1) (4 points) Which of the following integers is the decimal representation of the unsigned binary number 01001000 ?
   (A) 72, (B) 36, (C) 64, (D) 144, (E) none of above.

   (2) (4 points) Consider a code sequence with 10 instructions. Suppose it takes 15 clock cycles for a CPU to complete the execution of the code sequence. The Clock cycles Per Instruction (CPI) for the CPU is then equal to
   (A) 10, (B) 15, (C) 1.5, (D) 0.15, (E) none of above.

   (3) (4 points) Consider a five-stage (IF, ID, EX MEM, WB) RISC pipeline processor. Which of the following stages contains a Program Counter (PC)?
   (A) IF, (B) ID, (C) EX, (D) MEM, (E) WB.

   (4) (4 points) Consider a five-stage (IF, ID, EX MEM, WB) RISC pipeline processor. Which of the following stages contains the ALU for arithmetic operations?
   (A) IF, (B) ID, (C) EX, (D) MEM, (E) WB.

   (5) (4 points) Consider a cache with 10 ns hit time, 10% miss rate, and 200 ns miss penalty. The Average Memory Access Time (AMAT) for the cache is then equal to:
   (A) 10 ns, (B) 30 ns, (C) 200 ns, (D) 29 ns, (E) none of above.