

1. 解釋名詞: (每小題 3 分, 總計 15 分)
  - (a) Java, (b) client-server architecture, (c) RAID, (d) PC-relative addressing, (e) DeMorgan's law.
2. What is the average time to read or write a 512-byte sector for a typical disk rotating at 3600 RPM? The advertised average seek time is 15 ms, the transfer rate is 2 MB/sec, and the controller overhead is 2 ms. Assume that the disk is idle so that there is no waiting time. (10 分)
3. (a) 試證明利用一個 4-way multiplexer 可產生所有 2-variable Boolean logic functions (single output). (10 分)  
(b) 試以一個 4-way multiplexer 實現函數  $Z=AC+A'BC'$ . (10 分)
4. (a) 試設計一個 1-bit ALU, 使其可以執行 AND, OR, addition 及 2's complement subtraction. (15 分)  
(b) 試以(a)之結果設計一個 32-bit ALU, 使其可以在一個週期內執行一個 32 位元運算, 或兩個 16 位元運算, 或四個 8 位元運算. 請繪出 block diagram, data signals, 及 control signals. 並說明設計原理, 如 carry 的處理等. (10 分)
5. Assume an instruction cache miss rate of 5% and a data cache miss rate of 10%. If a machine has a CPI of 4 without any memory stalls and the miss penalty is 12 cycles for all misses, determine how much faster a machine would run with a perfect cache that never missed. Assume that the frequency of loads and stores is 33%. (10 分)
6. Suppose you want to perform two sums: one is a sum of two scalar variables and one is a matrix sum of a pair of two-dimensional arrays, size 100 by 100. What speedup do you get with 100 processors? (10 分)
7. (a) 比較 synchronous 及 asynchronous buses 的優缺點. (5 分)  
(b) 試列舉出至少三項影響 bus bandwidth 的因素. (5 分)