

大同大學 九十二 學年度研究所碩士在職班入學考試試題

考試科目: 計算機概論

所別: 資訊工程研究所

第 1/3 頁

註: 本次考試 不可以 參考自己的書籍及筆記; 不可以 使用字典; 不可以 使用計算器。

本試卷共分兩個部分, 第一部份為簡答題, 第二部分為計算或程式題, 請標明題號做答。

Part 1:

Give short but clear answers to the following terms. (2 points each)

1. What does *relational* mean in a relational DBMS?
2. What does *real-time* mean in a real-time operating system?
3. What does *multi-tier* mean in a multi-tier software architecture?
4. What does *multithreading* mean in a multithreading application?
5. What does *buffer-overflow* mean in a buffer overflow programming flaw?
6. Latency
7. Amdahl's law
8. Displacement addressing
9. Sign-extend
10. Least recently used

What is the major difference (2 points each)

11. between *batch* and *timesharing* systems?
12. between *lossy* and *lossless* compression techniques?
13. between *packet-switched* and *circuit-switched* networks?
14. between *peer-to-peer* and *client/server* network architectures?
15. between *partition* and *paged* memory management techniques?
16. between *preemptive* and *nonpreemptive* multitasking environments?
17. between *race condition* and *deadlock* problem in a multiprogramming environment?
18. between the data structures, *queue* and *stack*?
19. between the network devices, *router* and *repeater*?
20. between the language translation programs, *compiler* and *interpreter*?

Part 2:

21. (4%) Which of the following sorting algorithms has the average case time complexity $O(n \log n)$ and the worst case time complexity $O(n^2)$? When does its worse case happen?
(a) quick sort (b) heap sort (c) merge sort (d) bubble sort (e) insertion sort

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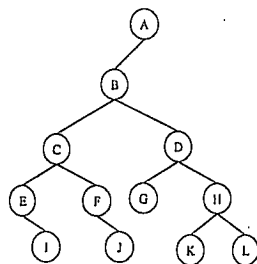
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第 2/3 頁

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22. (4%) Give the following traversal sequences of the binary tree.



(a) preorder traversal

(b) postorder traversal

23. (4%) Draw the following network topologies and describe the major weakness of them respectively.

(a) bus topology; (b) star topology.

24. (4%) What does the following function do? What will be the output of the function call **mystery** (87, 10)?

```
function mystery(a, b)
  if b ≤ 1
    return a;
  else
    return a + mystery(a, b-1);
```

25. (4%) What will Mainprogram **main** print if it calls Subprogram **sub**

(a) by value? (b) by reference?

```
Mainprogram main
x ← 1;
y ← 2;
z ← 7;
sub (x, x, x+y, z);
print z;
```

```
Subprogram sub(a, b,
c, d)
b ← a + a;
```

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第 3/3 頁

註：本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 不可以使用計算器。

26. (8%) Suppose that a single-chip microprocessor P operating at a clock frequency of 50 MHz, is replaced by a new model P' , which has the same architecture as P but has a clock frequency of 75 MHz.

(a) If P has a performance rating of p MIPS for a particular benchmark program Q , what is the corresponding MIPS rating p' for P' ?

(b) P takes 250 seconds to execute Q in a particular personal computer system C . On replacing P by P' in C , the execution time of Q drops only to 220 seconds. Suggest possible reasons for this disappointing performance improvement.

27. (8%) Two different compilers are being tested for a 500 MHz machine with three different classes of instructions: Class A, Class B, and Class C, which require one, two, and three cycles, respectively. Both compilers are used to produce code for a large piece of software. The first compiler's code use 5 million Class A instructions, 1 million Class B instructions, and 1 million Class C instructions. The second compiler's code uses 10 million Class A instruction, 1 million Class B instruction, and 1 million Class C instructions.

(a) Which sequence will be faster according to MIPS?

(b) Which sequence will be faster according to execution time?

28. (8%)

(a) Why pipelines are used in the modern computer design?

(b) When design a pipelined computer, what problems must be faced and how to solve them?

29. (16%) Suppose there are two machines A and B with same native cycles per instruction C . The following table is the associated cache system for machines A and B.

	cache size	miss rate	clock cycle time
Machine A	32 kB	2%	2ns
Machine B	16 kB	3%	1.6ns

Assume that the miss penalty to the secondary cache is 20 ns, there are 1.5 memory references per instruction (1 instruction reference and 0.5 data references) and the total instructions for the benchmark program is I .

(a) Find the memory stall clock cycles for each machine in term of I .

(b) Find the CPU time in terms of C and I .

(c) For what C , machine B will be faster that machine A?

(d) What conclusions can you make from these calculations?