

國立台灣科技大學九十五學年度碩博士在職專班招生試題

系所組別：電機工程系碩士在職專班丙組、丙一高職教師組

科目：計算機概論

總分 100 分

Problem 1:

(15 %) Daisy-chaining is a commonly used bus arbitration algorithm. Draw a diagram to illustrate bus arbitration using daisy-chaining method, and briefly explain how it works. What are the advantages and drawbacks of daisy-chaining bus arbitration?

Problem 2:

(15 %) Briefly describe the differences of volatile and nonvolatile memory. Give two examples of each type of memory.

Problem 3:

(20 %) Which of the following memories are possible? Which are not feasible? Explain.

- (a) 10-Bit address, 1024 cells, 8-bit cell size
- (b) 10-Bit address, 1024 cells, 12-bit cell size
- (c) 9-Bit address, 1024 cells, 10-bit cell size
- (d) 10-Bit address, 10 cells, 1024-bit cell size
- (e) 1024-Bit address, 10 cells, 10-bit cell size

Hint: A cell is the basic element of memory and is regarded as an addressable location.

Problem 4: (15 %) True/False

- (a) (3 %) To support larger numbers, the IEEE double floating point format uses 64 bits, 32 of which are for the exponent.
- (b) (3 %) Memory caches are relatively large pools of fast, expensive memory.
- (c) (3 %) For a given number of bits, a Two's Complement representation has more negative numbers than positive numbers.
- (d) (3 %) If $x = 0xDEADBEEF$ and x is an `int` then $(x \gg 16) == 0xDEAD$ is true.
- (e) (3 %) Main memory normally operates slower than the central processor.

Problem 5: (20 %)

A computer program reads the input symbol into an array in memory, adding symbols to the end of the array until the end-of-file symbol is met. The number of input symbols is not known in advance, and no approximation assumptions can be made about it.

To save memory, the program first allocates an array of length $L = 1$. Then, whenever the array gets full, a new and larger array of length $M > L$ is allocated, and the data from the old array is copied to the new array (L copying operations), and the



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old array is de-allocated.

Consider we use the length $M = L + d$ (where d is a constant) for incrementing the size of an array when it overflows. Write a recurrence and solve it to compute how many copying operations are required to get to the array of length n .

Problem 6: (15 %)

Given the following fragment of C source code:

```
void main(void) {
    char s[] = "String1";
    char *sa[] = {"String2", "String3", "String4",
                 "String5"};
    ...
}
```

- (a) (3 %) If you're asked to input a matrix U in only one command line with elements specified as follows:

$$U = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

What would be this command line in C?

For each of the array subscript expressions in the left column, write an equivalent pointer dereference expression in the right column:

(b) (2 %) $s[3]$ _____

(c) (2 %) $sa[1]$ _____

(d) (3 %) $U[0][0]$ _____

For each of the pointer dereference expressions in the left column, write an equivalent array subscript expression in the right column:

(e) (2 %) $*((*sa) + 1)$ _____

(f) (3 %) $*(*(U + 1) + 1)$ _____

所有答案必須寫在答案卷上，寫於試題者不予計分。

