

國立中央大學 資訊工程學系  
九十六學年度 碩士在職專班 招生入學考試命題紙

科目： 計 算 機 概 論 (含資料結構) 第一頁 共 <sup>三</sup>頁

**Part I (30%).** 第 1-20 題為單選題, 每題 3 分, 答錯不倒扣

1. The following binary have a sign in the leftmost bit and, if, negative, are in 2's complement form.

101110 – 110111=?

(1) -8 (2) -10 (3) 27 (4) -9

2. Convert unsigned Hexadecimal number C5.A to the decimal number

(1) 197.625 (2) 214.3125 (3) 17.10 (4) 125.625

3. Which function must be performed by the network layer in OSI protocol?

(1) streaming (2) encryption (3) routing (4) authentication checking

4. What is the worst-case time complexity for the quick-sort algorithm?

(1)  $O(n^2)$  (2)  $O(n \log n)$  (3)  $O(n)$  (4)  $O(\log n)$

5. Which of the following is not true for the JPEG compression standard.

(1) apply DCT transform (2) undergo quantization process (3) can compress image data (4) is a lossless compression method.

6. which of the following is usually not an advantage when use Object-Oriented language?

(1) optimal cost of memory size (2) software reuse (3) ability of inheritance (4) information hiding

7. which of the following software is responsible to assemble all necessary functions from system library and programmers' sources?

(1) loader (2) linker (3) interpreter (4) assembler

8. which of the following memory is usually the fastest in a computer system?

(1) registers (2) DVD drives (3) hard disks (4) RAM

9. which of the following feature decrease the modularity of a program the most?

(1) while loop (2) function (3) class (4) go-to statement

10. When the demanded memory is larger than the available physical main memory, part of demanded memory is mapped to the external storage. This arrangement provides what kind of feature for the programmers?

(1) buffer overflow (2) cache (3) memory cluster (4) virtual memory

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科目： 計算機概論 (含資料結構) 第二頁 共三頁

Part II (70%). 第 11,12 題為程式題, 各為 6 及 14 分; 第 13 至 17 題, 各為 5 分

11. (6%) What is the output of the following C program?

```
#include <stdio.h>
int b[] = { 4, 2, 7, 3, 0, 9, 3, 0 };

int fl(unsigned a)
{
    if (b[a] == 0) { return 0 };
    else {
        printf( "%d\n", b[a]);
        return (b[a] + fl( (a+1) ));
    }
}

int main()
{
    int i;
    i = fl (1);
    printf( "%d\n", i);
    return 0;
}
```

12. (14%) Use C language to write a function f2 that has the same functionality as fl in question 11, but use only while loop instead of recursion. (output of fl, the printf command, can be omitted)

13. (10 %) Reorder the following efficiencies from smallest to largest:

$n \log_2(n)$   
 $n + n^2 + n^3$   
 $2^4$   
 $n^{0.5}$

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14. (10%) Insert the following elements (key, value) pairs to a red-black tree:

(this, 1)

(is, 1)

(data, 1)

(structure, 1)

(exam, 1)

Show the resulting tree (note: keys are compared by alphabetical order)

15. (10%) In open hashing, with the quotient-offset collision handler, insert the following keys into a table of size 11: 21, 31, 49, 22, 27, 201, 142, 507. Show the result.

16. (10%) For red-black tree, (a) if a black element has only one child, that child must be a red leaf. Why? (b) If a red element has any children, it must have two children and they must be black. Why?

17. (10%) Insert the following elements to an empty binary search tree and an empty heap, respectively:

18, 37, 59, 28, 203, 141, 507, 92, 303, 404

Show the results.