

國立中央大學八十七學年度碩士班研究生入學試題卷

所別: 資訊工程研究所 不分組 科目: 計算機概論 共 2 頁 第 1 頁

1. Please design a mechanism to detect overflow or underflow of the sum of two four-bit numbers (for example, $a_3a_2a_1a_0$ and $b_3b_2b_1b_0$) using 2's complement? For example, $2+3$ will have a correct value, however, $6+7$ will cause overflow. (10%)
2. Assuming that x is an integer array and that this function call is made: `max = calc_max (x[0], x[1]);` which of the following would be a possible function header? (6%)
 - (a) `int calc_max (int x[0], int x[1]`
 - (b) `int calc_max (int *x[0], int *x[1]`
 - (c) `int calc_max (int x, int y`
 - (d) `int calc_max (int *x, int *y`
3. Given the following function: (8%)

```
void check_pressure (PATIENT_RECORD *patient)
{
    if ( *patient.pressure.systolic > 160 )
        *patient.pressure.danger_level = TRUE;
    else
        patient -> pressure.danger_level = FALSE;
}
```

Are the expressions `*patient.pressure.systolic` and `patient -> pressure.danger_level` correct? If it is wrong, explain and write the correct expression.
4. Write a recursive function `int sum_of_sq (int n)` using C to compute the sum of the squares of the integers from 1 to n , i.e., $1^2+2^2+\dots+n^2$, here n is supplied in the initial function call. (10%)
5. We are given a set of six positive weights 2, 3, 5, 7, 9, 13. Exactly one of these weights is to be associated with each of the six external nodes in a binary tree with 5 internal nodes. The weighted external path length of such a binary tree is defined to be $\sum_{1 \leq i \leq 6} q_i k_i$, where k_i is the distance from the root node to the external node with weight q_i . Please construct a binary tree with minimal weighted external path length and compute the minimal weighted external path length of the tree. (12%)
6. Please finish the insertion of keys in a B'-tree of order $p=3$ and $p_{leaf}=2$ of the following sequence: (14%)
8, 5, 1, 7, 3, 12, 9, 6

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7. Design a 1, 3, 5, 7, 6 binary counter by using a minimum number of D flip-flops. Please write the Sum Of Product function for each D flip-flop. (10%)
8. Design a 2 digit SEQUENTIAL decimal adder by using TWO 4bit binary adder (one for addition, one for carry). Explain your idea. (10%)
9. (a) Find the minimum sum-of-products solution for the following function. (5%)
$$F(a,b,c,d) = \sum m(1,3,4,5,6,7,10,12,13) + \sum d(2,9,5)$$

(b) Implement the above function by using a minimum number of NAND gates. (5%)

10. Write C++ programs according to the following declaration.

```
Class Array {  
    friend ostream &operator <<(ostream &, Array &)  
public:  
    .....  
    Const Array &operator=(const Array&);  
    .....  
private:  
    int *ptr;  
    int size;  
}
```

Write the programs (function) for << and = operator. (10%)