

淡江大學 97 學年度碩士班招生考試試題

系別：電機工程學系積電計算系統組
電機工程學系機器人工程碩士班

科目：計算機概論

72-1

准帶項目請打「V」	
✓	簡單型計算機

本試題共 2 頁，7 大題

- (15%) In the pipelining system, structure hazard, control hazard, and data hazard may appear to degrade the performance. Please explain these three hazards and give proper solutions to remove them, respectively.
 - Structure hazard
 - Control hazard
 - Data hazard
- (20%) Please briefly describe the differences between the following terms:
 - FIFO / FILO
 - Temporal locality / Spatial locality
 - Write through / Write back
 - Structured programming / Object oriented programming
- (10%) Construct a 3-bit counter using three T flip-flops and several basic gates. One of the two input signals can reset the counter to 0, called *reset*, and the other will increment the counter, called *inc*. The outputs should be the value of the counter. When the counter has value 7 and is incremented, it should go back to 0.
- (10%) Design a circuit which compares two 4-bit numbers, A and B , to check if they are equal. The circuit has one output x , so that $x = 1$ if $A = B$, $x = 0$ if $A \neq B$.
- (20%) A particular type of Hamming code has 8-bit codeword $P_8D_7D_6D_5P_4D_3P_2P_1$. The parity bits P_i are obtained from the data bits D_j according to logical equations
$$P_1 = D_3 \oplus D_5 \oplus D_6, P_2 = D_3 \oplus D_5 \oplus D_7, P_4 = D_3 \oplus D_6 \oplus D_7, P_8 = D_5 \oplus D_6 \oplus D_7.$$
 - Could this code correct any single-bit error? (Derive the correction rules briefly)
 - Could the code detect all double-bit errors in addition to correcting single errors? (If yes/no, explain your answer using example/counterexample)
- (10%) Consider the following VB program, in the execution mode, what is printed out while pressing the Command1?

```
Private Sub Command1_Click()  
    Dim Num, Power, Leader As Integer  
    Dim Sum As Integer  
  
    Num = 68413  
    Power = 4  
    Do  
        Leader = (Num \ 10 ^ Power)  
        Sum = Sum + Leader  
  
        Print Sum  
  
        Num = Num - (Leader * 10 ^ Power)  
        Power = Power - 1  
  
    Loop Until Num < 10  
    Sum = Sum + Num  
    Print Sum  
End Sub
```

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7. (15%) Consider the following C++ program, what is printed out after execution?

```
#include <iostream.h>

#define SIZE 100

int recur_binary_search(int low, int high, int key);

int a[SIZE];
int chance = 1;

int main(void)
{
    int i;

    for(i=0; i<SIZE; i++){
        a[i] = i+1;
    }

    if(recur_binary_search(0, SIZE-1, 31) != -1){
        cout << chance << " times" << endl;
    }else{
        cout << "Not found!!" << endl;
    }

    return 0;
}

int recur_binary_search(int low, int high, int key)
{
    int middle;

    while( low <= high){
        middle = (low + high)/2;
        cout << "a[" << middle << "]" << '\t';
        if(key == a[middle]){
            cout << endl;
            return middle;
        }else if(key < a[middle]){
            chance++;
            return recur_binary_search(low, middle-1, key);
        }else{
            chance++;
            return recur_binary_search(middle+1, high, key);
        }
    }

    return -1;
}
```