淡江大學97學年度碩士班招生考試試題

72-1

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 B班

科目：計 算 機 概 論 積体电路与计算机系统组

准帶項目請打「V」	
✓	簡單型計算機

本試題共 2 頁，7 大題

1. （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.
   （a） Structure hazard
   （b） Control hazard
   （c） Data hazard
2. （20%）Please briefly describe the differences between the following terms:
   （a） FIFO / FILO
   （b） Temporal locality / Spatial locality
   （c） Write through / Write back
   （d） Structured programming / Object oriented programming
3. （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.
4. （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 $A \neq B$.
5. （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 Dj according to logical equations
   $P_1 = D_3 \oplus D_5 \oplus D_6$, $P_2 = D_3 \oplus D_5 \oplus D_7$, $P_4 = D_3 \oplus D_6 \oplus D_7$, $P_8 = D_5 \oplus D_6 \oplus D_7$.
   （a） Could this code correct any single-bit error? (Derive the correction rules briefly)
   （b） Could the code detect all double-bit errors in addition to correcting single errors? (If yes/no, explain your answer using example/counterexample)
6. （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
```

本試題雙面印製

◀注意背面尚有試題▶

72-2

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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;
}
```