系別：電機工程學系機器人工程碩士班　科目：計 算 機 概 論

考試日期：2月28日(星期一) 第2節　　　　　本試題共 8 大題， 2 頁

1. （12%）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. （8%）Please describe and compare the following two scheduling methods for advanced pipelining architectures-- scoreboard and the Tomasulo algorithms.

3. （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

　　（e）　Loop / Recursion

4. （15%）Use clocked T flip-flops, AND gates and OR gates to design a counter, which counts in the following sequence: 0000, 1000, 1100, 1010, 1110, 0001, 1001, 1101, 1011, 1111, 0000, …, for illustrating design, you should construct a state transition graph (STG).

5. （5%）Design a circuit which compares two 4-bit numbers, A $(a_3a_2a_1a_0)$ and B $(b_3b_2b_1b_0)$, to check if they are equal. The circuit has one output x, so that $x = 1$ if $A > B$, otherwise, $x = 0$.

6. （10%）Draw the binary tree which has the following two traversals and show the associated postorder traversal. (Assume each node of the tree contains single-character information only)

Preoreder: GFEABDC

Inorder: EFGDBAC

背面尚有試題

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

```cpp
int main(void)
{
    int decimal;
    unsigned int mask;
    int i;

    decimal = 104;
    mask = 0x80;
    for(i=0; i<8; i++){
        if(decimal & mask){
            cout << '1';
        }else{
            cout << '0';
        }
        mask >>= 1;
    }
    cout << endl;

    return 0;
}
```

8. （15%）Consider the following C++ program, what is printed out after execution?

```cpp
int main(void)
{
    int a[] = {23, 31, 3, 19, 54, 12};
    int min;
    int i, j;
    int temp;

    for(j=0; j<sizeof(a)/sizeof(a[0]); j++){
        cout << a[j] << '\t';
    }
    cout << endl;

    for(i=0; i<sizeof(a)/sizeof(a[0])-1; i++){
        min = i;
        for(j=min+1; j<sizeof(a)/sizeof(a[0]); j++){
            if(a[j] < a[min]){
                min = j;
            }
        }
        if(min != i){
            temp = a[i];
            a[i] = a[min];
            a[min] = temp;
        }
        for(j=0; j<sizeof(a)/sizeof(a[0]); j++){
            cout << a[j] << '\t';
        }
        cout << endl;
    }

    return 0;
}
```