國立中央大學八十八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. Given a strictly binary tree *t* in which the *n* leaves are labeled as nodes 1 through n, let *level(i)* be the level of node *i* and let freq(i) be an integer assigned to node i. Define the weighted path length of *t* as the sum of *freq(i)*level(i)* over all leaves of *t*. Answer the following two questions. (i) Suppose we have six *freqs* 3, 4, 6, 8, 11, 13. Please illustrate the sequence of the trees we would get. (12%) (ii)Which one of the following is the strictly binary tree with minimum weighted path length: (a) Huffman tree (b) Binary search tree (c) Heap tree (d) Threaded binary tree. (5%)

2. Which one of the following statements about data structures is correct. (2%)
(a) A data structure is a finite sequence of operations to solve a problem.
(b) An abstract data type combines the logical definition of a data structure with its physical implementation.
(c) Two entire structures can be tested for equality as long as they are the same data type.
(d) The simplest form of array is a one-dimensional array that may be defined abstractly as a finite ordered set of homogeneous elements.

參考用

3. Best case for selection sort is when the data are (3%)
(a) in order
(b) in reverse order
(c) in random order
(d) none of the above: selection sort works the same way regardless of the data ordering

4. Since precedence plays an important role in transforming infix to postfix, let us assume the existence of a function prcd(op1, op2), where op1 and op2 are characters representing operators. This function returns TRUE if op1 has precedence over op2 when op1 appears to the left of op2 in an infix expression without parentheses. prcd(op1, op2) returns FALSE otherwise. For example, prcd('*', '+') and prcd('+', '+') are TRUE, whereas prcd('+', '*') is FALSE. To use the function to accommodate parentheses, please set the following precedence rules for parentheses using TRUE or FALSE: (8%)

prcd('(', op) =	for any operator op
prcd(op, '(') =	for any operator op other than ')'
prcd(op, ')') =	for any operator op other than '('
prcd(')', op) =	for any operator op

5. Please use full adders and exclusive-OR gate to design an adder-subtractor circuit. The circuit input M controls the operation. When M = 0 the circuit is an adder and when M = 1 the circuit becomes a subtractor. (10%)

6 （數字表示法）說明我們原來整數以 16bit 表示，變成以 32bit 來表示。實數由 32bit 變成以 64bit 來表示。在 cpu 不變下，諸就（1）所佔空間（2）運算速度（3）表示範圍（4）準確度，說明其不同。（12%）

7. Consider a data structure to represent the queue. A queue node consists of an information field and a field holding a pointer to the next node. Given the following declarations:

```
typedef struct node_type {
        ITEM_TYPE       info;
        struct node_type    *next;
    }   NODE_TYPE;
typedef struct {
            NODE_TYPE      *front;
            NODE_TYPE      *rear;
        } Q_TYPE;
```

Please fill the following blanks in the implementation of the operation enqueue. The empty_queue (queue) returns true if the queue is empty. (10%)

```
void enqueue (Q_TYPE *queue, ITEM_TYPE item)   /add a new item to the rear of
the queue */
{
    NODE_PTR   new_node;
    new_node = ( NODE_PTR ) malloc (sizeof (NODE_TYPE));
    if (new_node != NULL ) {
    _____(1)_____;
    _____(2)_____;
       if ( empty_queue (queue ) == TRUE )
          _____(3)_____;
       else
          _____(4)_____;
       _____(5)_____;
  }
}
```


8. （數位系統）f =(0+5+9+15+8+10+13)+don't care(2+7+1)
   (1) 將此函數以 sum of product 最簡化方式表示出來（５%）
   (2) 分別以 NAND gate, decoder, ROM 方式製作出來（９%）

9 （程式設計）有一個８＊８的距陣，輸入一個位置 （X，Y）座標
輸出由此位置走三步（在每一個位置，可以往 上、下、左、右四個方向）
可以到達的位置。（距陣註標由 0到７）請寫出想法與如何測試。（１４%）

10 （基本知識廣度）請將下列名詞以樹狀的結構方式連結起來成一個概念圖，
說明你這樣畫的原因。(只能使用一個樹狀結構 tree，不可以用圖 graph)在
此樹中可以自己加入名詞，（１０%）
Router, XML, bridge, CORBA, loader, HTML, COM, repeater,　YACC
VB, Parser, ODBC, JDBC, DCOM, compiler, power builder
SGML, Delph, gateway, lexical scanner, hub