元智大學 101 學年度研究所 **碩士班** 招生試題卷

系(所)別：電機工程學系碩士班　組別：計算機工程組　科目：計算機概論　用紙第 1 頁共 2 頁

●不可使用電子計算機

1. a, b, c, d are four Boolean variables. a=c=true, b=d=false, please compute the values of the following formulas (6%)
   i. (a AND b) AND (c OR d) (2%)
   ii. (a AND c) OR (b OR d) (2%)
   iii. (a AND b) OR (c OR d) (2%)

2. Please transfer the two following numbers into decimal: (a) 3FAA (hexadecimal) (b) 0010 (binary) (4%)

3. When executing multiple processes in an OS, sometimes a "deadlock" happens. Describe the definition and the cause of "deadlocks". (5%)

4. What is the difference between RISC and CSIC computers? (5%)

5. What is the difference between TCP and UDP? (5%)

6. What are the three main components of the CPU? Please also describe their functionalities. (10%)

7. A multiprogramming operating system uses an apportioning scheme and divides the 60 MB of available memory into four partitions of 10MB, 12MB, 18MB, and 20MB. The first program to be run needs 17 MB and occupies the third partition. The second program needs 8MB and occupies the first partition. The third program needs 10.5 MB and occupies the second partition. Finally, the fourth program needs 20 MB and occupies the fourth partition. What is the total memory used? What is the total memory wasted? What percentage of memory is wasted? (10%)

8. A multiprogramming operating system uses paging. The available memory is 60 MB divided into 15 frames, each of 4 MB. The first program needs 13 MB. The second program needs 12 MB. The third program needs 27 MB. (10%)
   i. How many frames are used by the first program? (1%)
   ii. How many frames are used by the second program? (1%)
   iii. How many frames are used by the third program? (2%)
   iv. How many frames are unused? (2%)
   v. What is the total memory wasted? (not including the memory lost in each frame) (2%)
   vi. What percentage of memory is wasted? (2%)

9. Assume in a byte machine, the address of an array element A[3,3] is 121 and that of A[6,4] is 159. Find the address of A[4,5]. (10%)

10. Binary tree traversal (15%)
    (1) What is bread-first-traversal? (draw picture to help understand) (4%)
    (2) What is depth-first-traversal? (draw picture to help understand) (4%)
    (3) Can we use recursive algorithm to write bread-first-traversal program? (3%)
    (4) If we want to develop non-recursive algorithms for depth-first-traversal and bread-first-traversal, what data structures will be used respectively? (stack or queue) (4%)

11. Draw the expression tree and find the prefix expression for the following postfix expression: (10%)

    AB-CD*+EF-/

12. If the efficiency of the algorithm **doIt(...)** can be expressed as $O(n)=100n^2$, calculate the efficiency of the following program segment: (10%)

(a)
```
1  i = 1
2  loop i <= n
     1  doIt (...)
     2  i = i + 1
3  end loop
```

(b)
```
1  i = 1
2  loop (i < n)
     1  doIt (...)
     2  i = i * 2
3  end loop
```