國 立 清 華 大 學 命 題 紙

97 學年度 資訊系統與應用研究所 （所） 甲 組碩士班入學考試

科目 基礎計算機科學 科目代碼 2101 共 2 頁第 1 頁 *請在【答案卷卡】內作答

1. (10%) Given a tree, how many different ways can be applied to traverse the tree. To uniquely determine a tree, how many (at lease and exactly) tree traversal sequences are needed? Please give a formal proof of your answer.

2. (7%) What is the difference between trap and interrupt?

3. (a) (8%) In general, software size can be described by length, functionality and complexity. Lines of Code (LOC) is one of the most common and used metric to estimate software size. It includes all lines containing program headers, declarations and executable and non-executable statements. Please list two advantages and two disadvantages of using LOC.

   (b) (8%) The following table shows the data collected to assess quality and productivity for three young programmers *A*, *B* and *C*.

Programmer	Software Development LOCs per month	Code Reuse Proportion	Coupling level	Cohesion Ratio	Cyclomatic complexity
A	1000	20%	0.8	0.2	10
B	1500	10%	0.2	0.8	12
C	3000	50%	0.5	0.5	20

   i. Which one of the programmers has a higher productivity? Why?

   ii. Which one of the programmers produces better quality code? Why?

4. (a) (7%) Please compare polled I/O and interrupt-driven I/O.

   (b) (10%) State the difference between NMI and IRQ. Why can't NMI be used to handle interrupt requests from I/O peripherals.

5. (10%) If $f(n) = 2f(4n^{1/2}) + \log_2 n$, then, what is $f(n)$ (as the big O function of n)?

6. (7%) A relation R that is reflexive, symmetric, and transitive is said to be an equivalence relation. Show that the following relation is an equivalence relation.

The relation R on integer defined by iRj if and only if $i = j$.

7. (8%) Determine whether each of the following implications is true or false.

(a) If 1+1=2, then 2+2=5.
(b) If 1+1=3, then 2+2=4.
(c) If 1+1=3, then 2+2=5.
(d) If pigs can fly, then 1+1=3.
(e) If 1+1=3, then God exists.
(f) If 1+1=3, then pigs can fly.
(g) If 1+1=2, then pigs can fly.
(h) If 2+2=4, then 1+2=3.

8. (6%) There are 10 copies of one book and one copy each of 10 other book. In how many ways can we select 10 books?

9. (6%) How many subsets of a $(2n+1)$-element set have n elements or less?

10. (6%) How many integers between 1 and 1,000,000 have the sum of the digits equal to 20?

11. (7%) Solve the recurrence relation $\sqrt{a_n} = \sqrt{a_{n-1}} + 2\sqrt{a_{n-2}}$ with initial conditions $a_0 = a_1 = 1$.