# 淡江大學九十四學年度碩士班招生考試試題 147-1

系別：資訊管理學系　　科目：離 散 數 學 導 論

| 准帶項目請打「V」 | |
|---|---|
| | 簡單型計算機 |

本試題共 2 頁

1. Suppose that 100 of 120 students in a department of information management take at least one of the programming languages C++, Java, and VB. Also suppose

   65 study C++　　20 study C++ and Java
   45 study Java　　25 study C++ and VB
   42 study VB　　15 study Java and VB

   a. Find the number of students who study all three programming languages. 6%
   b. Fill in the correct numbers, $n_1$ to $n_8$, of students in each of the eight regions of the Venn diagram of Fig. 1. Here **C**, **J**, **V** denote the sets of students studying C++, Java, VB, respectively. 16%
   c. Determine the number $k$ of students who study (i) exactly one programming language, and (ii) exactly two programming languages. 8%

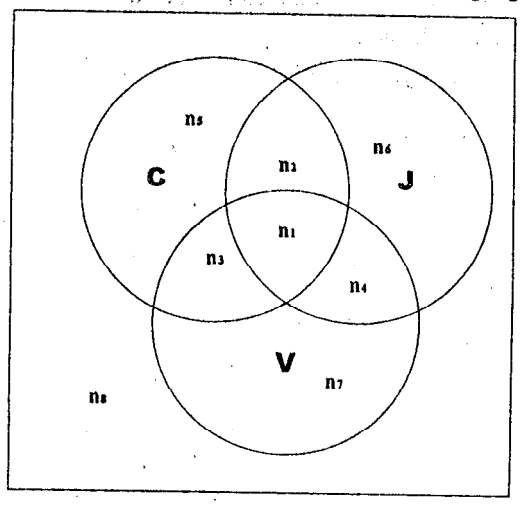


Fig. 1.

2. Let $N=\{1,2,3,\ldots\}$ and let $\cong$ be the relation in $N\times N$ defined by

   $$(a,b)\cong(c,d) \quad \text{iff} \quad a+d=b+c$$

   a. Prove $\cong$ is an equivalence relation. 10%
   b. Find the equivalence class of (2,7), i.e. [(2,7)]. 10%

3. Refer to the following classes of sets:

   $E=[\{1,2,3\},\{2,3\},\{a,b\}]$, $F=[\{a,b\},\{1,3\}]$

   Find:

   a. $E\cup F$, 4%
   b. $E\cap F$, 4%
   c. $E\setminus F$, 4%
   d. the power set $P(E)$ of $E$. 8%

# 淡江大學九十四學年度碩士班招生考試試題 104-2

系別：資訊管理學系　　科目：離 散 數 學 導 論

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本試題共 2 頁

4. The Ackermann function is a function with two arguments each of which can be assigned any nonnegative integer: 0, 1, 2,....This function is defined as follows:

$$A(m,n)=\begin{cases} n+1 & if \quad m=0 \\ A(m-1,1) & if \quad m\neq 0 \quad but \quad n=0 \\ A(m-1,A(m,n-1)) & if \quad m\neq 0 \quad and \quad n\neq 0 \end{cases}$$

Step by step, use the definition of the Ackermann function to find $A(1,3)$. 15%

5. Test the validity of the following argument:

(premises) $S_1$: If I study, then I will not fail mathematics.

$S_2$: If I do not play basketball, then I will study.

$S_3$: But I fail mathematics.

(conclusion) S: Therefore, I played basketball. 15%