

# 淡江大學 100 學年度進修學士班轉學生招生考試試題

系別：資訊工程學系三年級

科目：離散數學

13-1

考試日期：7月20日(星期三) 第4節

本試題共 8 大題， 2 頁

本試題雙面印刷

- Let  $A = \{a, b, c, d\}$ ,  $B = \{b, c, e\}$ . What are
  - $A \cap B$  (3%)
  - $A \cup B$  (3%)
  - $A - B$  (3%)
  - $B - A$  (3%)
- If  $C - D = \{2, 5, 9\}$ ,  $D - C = \{1, 4, 7\}$ , and  $C \cup D = \{1, 2, 4, 5, 6, 7, 8, 9\}$ , What are the sets  $C$ ,  $D$ , and  $C \cap D$ . (12%)
- Evaluate the sum of each of the following series.
  - $\binom{2}{0} + \binom{2}{1} \cdot 2^1 + \binom{2}{2} \cdot 2^2 = ?$  (3%)
  - $\binom{3}{0} + \binom{3}{1} \cdot 2^1 + \binom{3}{2} \cdot 2^2 + \binom{3}{3} \cdot 2^3 = ?$  (3%)
  - $\binom{8}{0} + \binom{8}{1} \cdot 2^1 + \binom{8}{2} \cdot 2^2 + \binom{8}{3} \cdot 2^3 + \dots + \binom{8}{8} \cdot 2^8 = ?$  (8%)
- About well-formed formula (wff),
  - Complete the following truth table. (8%)
 

$p$	$q$	$\neg p$	$\neg q$	$\neg(p \vee \neg q)$	$\neg(p \vee \neg q) \rightarrow \neg p$
T	T				
T	F				
F	T				
F	F				
  - Determine whether  $\neg(p \vee \neg q) \rightarrow \neg p$  is *satisfiable* or not. (4%)
  - Similarly, determine whether  $(p \wedge q) \rightarrow p$  is a *tautology* or not. (6%)

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13-2

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5. Each of the following functions  $f: \mathbb{Z} \rightarrow \mathbb{Z}$  ( $\mathbb{Z}$ : set of all integers 整數), determine whether the function is *one-to-one* (一對一) and whether it is *onto* (蓋射). If the function is not onto, determine its *range* (值域)  $f(\mathbb{Z})$ .
- (a)  $f(x) = 2x$  (6%)  
(b)  $f(x) = x^2$  (6%)
6. Solve the following recurrence relation. (hint: use generating function method)  
 $a_n = 5a_{n-1} + 6a_{n-2}, \quad n \geq 1, \quad a_0 = 1, a_1 = 3$  (10%)
7. Find the coefficient of  $x^2y^3$  in  
(a)  $(2x + 3y)^5$  (4%)  
(b)  $(2x - 3y + 2)^8$  (6%)
8. A natural number (自然數) greater than 1 and not exceeding 100 must be either prime (質數) or divisible (整除) by 2, 3, 5 or 7.  
(a) Find the number primes not exceeding 100. (4%)  
(b) Find the number of natural numbers not exceeding 100 and which are either prime or even. (8%)