

# 淡江大學 105 學年度日間部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

48-1

考試日期：7月22日(星期五) 第3節

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1. (25%) For each of these arguments determine whether the argument is correct (T) or incorrect (F)
  - (a) \_\_\_  $\exists n(n^2 < 0)$ , where  $n$  is real number.
  - (b) \_\_\_ The negation of "Mary will bicycle or run tomorrow" is "Mary will not bicycle tomorrow, or Carlos will not run tomorrow."
  - (c) \_\_\_ "1+1=3" if and only if "2+2=5".
  - (d) \_\_\_  $f(x) = x^2 + 1$  and  $g(x) = x + 2$ ,  $g \circ f = x^2 + 3$ . ( $x$  is any real number)
  - (e) \_\_\_  $\{\emptyset, \{a\}, \{b\}\}$  is the power set of  $\{a, b\}$  ( $a, b$  are distinct elements)?
  
2. (20%) Prove that  $(p \leftrightarrow q) \oplus (p \leftrightarrow \neg q)$  is tautology. (Show the work in details to get full credits, 沒有證明過程 0 分)
  
3. (5%) (a) How many cards must be selected from a standard deck of 52 cards to guarantee that at least three cards of the same suit are chosen? \_\_\_  
  
(5%) (b) How many cards must be selected from a standard deck of 52 cards to guarantee that heart  $A$  is chosen? \_\_\_
  
4. (10%) There are two relations  $R_1$  and  $R_2$ .  
 $(x, y) \in R_1$  if and only if  $x \leq y$ .  
 $(x, y) \in R_2$  if and only if  $x \neq y$ , where  $x$  and  $y$  are real numbers.  
How many **nonzero** entry does the matrix representing relation  $R_1 \cup R_2$  on the set  $A = \{-50, -49, \dots, -2, -1, 1, 2, \dots, 49, 50\}$  consisting of the 100 integers \_\_\_\_\_
  
5. (20%) Mathematical induction:
  - (a) (5%) Find a formula for the sum of the first  $n$  even positive
  - (b) (15%) Complete the basis and inductive step of the proof of (a).
  
6. (15%): Suppose that the domain of the propositional functions  $P(x)$  and  $G(x)$  consists of 4 students, i.e. student A~D. Let  $P(x)$ ="x pass the exam",  $G(x)$ ="x is a girl", and only student C passed the DM exam. Express  $\forall x((x \neq C) \rightarrow G(x)) \vee \exists x \neg P(x)$  without quantifier, instead using only negation, disjunction, and conjunctions. (Show the work in details to get full credits, 沒有證明過程 0 分)