

淡江大學 101 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

考試日期：7 月 18 日(星期三) 第 4 節

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1. Multiple Choice (單選題 20 pts)

- (1) In a fair coin tossing game (擲公正骰子遊戲), p is the probability that it shows "3"(點數 3 出現的機率). If there is no "3" in a continuous 20 tosses, find the probability p in the next tossing. (如果連續擲了 20 次而點數 3 一直沒有出現，則下一次擲骰子時 p 值為) (a) $0 < p \leq 0.35$; (b) $0.35 < p \leq 0.5$; (c) $0.5 < p \leq 0.75$; (d) $0.75 < p \leq 0.99$; (e) none of above (以上皆非)
- (2) Consider the permutation on all the letters in the word *GOOGOL*. Let k = the number of different strings can be made. Then (a) $k \leq 35$; (b) $35 < k \leq 50$; (c) $50 < k \leq 85$; (d) $k > 85$.
- (3) Consider the permutation on all the letters in the word *GOOGOL*. Let k = the number of different strings can be made such that two *G* are together. (k = 兩個 *G* 連在一起的字串總數) Then (a) $k \leq 5$; (b) $5 < k \leq 10$; (c) $10 < k \leq 15$; (d) $k > 15$.
- (4) The negation of "It is Thursday and it is cold." is (a) It is not Thursday and it is not cold. (b) It is not Thursday or it is cold. (c) It is not Thursday and it is cold. (d) It is not Thursday or it is not cold. (e) none of above.
- (5) Suppose $B = \{x, \{x\}\}$. Then B has k subsets. (a) $k \leq 2$; (b) $2 < k \leq 4$; (c) $4 < k \leq 6$; (d) $k > 6$.

2. Determine whether each of the following is true (T) or false (F) (是非題 15 pt)

- (1) If $2+2 = 4$, then $1+1 = 3$.
- (2) If God exists, then $1+1=3$ or $2+2 = 4$.
- (3) $\neg(p \rightarrow q) \Leftrightarrow p \wedge \neg q$.
- (4) For any set A , $|A - \phi| = |\phi - A|$. (ϕ = empty set)
- (5) For any set A, B, C , if $A \subseteq B \cup C$, then $A \subseteq B$ or $A \subseteq C$.

Show the work in details to get full credits

- 3. Let $A = \{1, 2, 4, 8, 15\}$, $B = \{1, 3, 9, 18\}$. Find (a) $A \cup B$, (b) $A - B$, (c) $A \oplus B$, (d) the number of relations can be made from A to B . (12 pts)
- 4. Suppose $|A| = |B| = |C| = 100$, $|A \cap B| = 50$, $|A \cap C| = 40$, $|B \cap C| = 30$, and $|A \cup B \cup C| = 200$. Find $|A \cap B \cap C|$. (8 pts)
- 5. How many non-negative integer solutions are there to the equation $x_1 + x_2 + x_3 + x_4 + x_5 = 21$ such that $x_1 \geq 2$ and $3 \leq x_2 \leq 13$? (8 pts)
- 6. Use ordered rooted tree to represent the expression $((x+y) \uparrow 2) + ((x-4)/3)$. (8 pts)
- 7. There are 10 cards and 7 different envelopes (7 個不同信封). In how many ways can you put the 10 cards into the envelopes if (a) the cards are distinct (不相同); (b) the cards are identical (相同); (c) the cards are identical and no envelope can be left empty (卡片相同且每個信封都不能是空的) (15 pts)
- 8. Prove that $1 \cdot 1! + 2 \cdot 2! + \dots + n \cdot n! = (n+1)! - 1$, whenever n is a positive integer. (14 pts)