淡江大學 101 學年度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 17 日(星期二) 第 4 節　　本試題共 8 大題， 1 頁

1. Multiple Choice (單選題 4pt@5=20pts)

(1) Let k be the value of the **prefix** expression **+ − * 2 5 7 / ^ 2 3 4**
Then (a) $k \le 6$; (b) $6 < k \le 14$; (c) $14 < k \le 24$; (d) $k > 24$.

(2) If 1+1= 3, then some pigs can fly and some don't. The truth value of the statement is (a) true; (b) false.

(3) If g: A-->B and f: B-->C where A={1, 2, 3, 4}, B={a, b, c}, C={2, 7, 10}, and f and g are defined by g={(1,b), (2,a), (3,a), (4,b)}, f={(a,10), (b,7), (c,2)}. Let k = fog (3) (fog is the **composition** of g with f) then (a) k=2; (b) k=7; (c) k=10; (d) none of above.

(4) For the graph $K_{3,4}$, it has m vertices and n edges. Then (a) $m+n \le 5$; (b) $5 < m+n \le 10$; (c) $10 < m+n \le 15$; (d) $m+n > 15$.

(5) Suppose $|A| = 4$. Let k be the number of binary relation defined on A that are reflexive and symmetric. Then (a) $k \le 18$; (b) $18 < k \le 42$; (c) $42 < k \le 72$; (d) $k > 72$.

Answer the following in details to get full credits

2. Write the **negation** of the following: (10 pts)
(a) Some bananas are yellow. (b) If it is rainy, then we stay home.

3. Determine whether the proposition is a tautology: $((p \to q) \wedge \neg p) \to \neg q$. Justify. (10 pts)

4. In how many ways can a photographer at a wedding arrange **five** people in a row, including the bride and groom, if (16 pts)
(a) The bride is positioned somewhere to the left of the groom? (新娘在新郎的左邊，包含站在一起 or 不站在一起)
(b) The bride and the groom are not next to each other? (新郎&新娘不站在一起)

5. How many permutations of all 26 letters of the alphabet are there that contain at least one of the words **CART**, **SHOW**, **LIKE**? (10 pts)

6. Find the number of **integer** solutions to $x_1 + x_2 + x_3 = 23$ where $x_1 \ge 1, x_2 \ge 2, x_3 \ge 5$. (10 pts)

7. Determine whether the relation R on **Z** where "aRb $\Leftrightarrow$ |a|=|b|" is an equivalence relation. Explain. (10 pts)

8. Prove by induction that $1^2 - 2^2 + 3^2 - \ldots + (-1)^{n-1} n^2 = \dfrac{(-1)^{n-1} n(n+1)}{2}$ for every positive integer n. (14 pts)