淡江大學九十四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

准帶項目請打「V」	
X	簡單型計算機

節次： 7 月 13 日第 07 節

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Answers can be in the form of n^k, $n!$, $\binom{n}{r}$, C^n_r, but **not in** H^n_r.

Problems 1, 2: 直接作答於題目紙上，**3 ~ 6**：另寫於答案紙上，**必須將過程寫出**否則以一半分數計。

1. True or false. **If false, explain why.** (4 pts each, 40 pts total)

___(a) $\forall y \exists x\, (x > y^2)$ (consider x, y to be real numbers)

___(b) If the truth value for "p→ q" is **true** then the truth value of "q→ p" must be **false**.

___(c) $|\{\{a\},\{\{a, \{a\}\}, a\}, a\}| = |\{\phi, \{\phi\}, \{\phi\ \{\phi\}\}\}|$

___(d) For any set A, $|A - \overline{A}| < |A|$.

___(e) For any set A, $A \oplus \phi = A - \phi$.

___(f) For any set A, $|A - \phi| = |\phi - A|$.

___(g) For any set A, B, C, if $A \subseteq B \cup C$, then $A \subseteq B$ or $A \subseteq C$.

___(h) $\lceil -2.99 \rceil = -\lceil 2.99 \rceil$.

___(i) $\forall n\, (n^2 - 79n + 1601$ is prime(質數)) (consider n to be positive integer)

___(j) If $1+1 \neq 3$, then pigs can not fly.

2. Filling the blanks (填空) (3 pts each, total = 18 pts)

(a) Compute each of these: $\sum_{i=1}^{3}\sum_{j=0}^{2}(i+2j)$ = ________ $\prod_{n=2}^{4}(2n-1)$ = ________

(b) gcd(0, 100) = ______, lcm(0, 200) = ______. (gcd 最大公因數, lcm 最小公倍數)

(c) The value of the arithmetic expression whose prefix representation is " − 9 / + 6 2 − 5 3 " is________.

(d) $C^{15}_0 + C^{15}_1 + C^{15}_2 + \ldots + C^{15}_{15}$ = ____________

3. Consider functions f from set A={1, 2, 3, ...,10} to set B ={a,b,c,d} (12 pts)

(a) How many functions are one to one? (b) How many functions are onto?

4. Define a relation R on {2, 3, 5, 6, 9, 10, 12, 14, 18, 30} such that aRb means $a|b$. Show it is a poset and sketch the Hasse diagram. (7+5 pts)

5. How many **nonnegative integer solutions** are there to the equation $x_1 + x_2 + x_3 + x_4 + x_5 = 21$ such that $x_1 \geq 2$? (10 pts)

6. Show that $1 \cdot 1! + 2 \cdot 2! + 3 \cdot 3! + \cdots + n \cdot n! = (n+1)! - 1$ for n = 1, 2, 3, ... (8 pts)

(hint: prove it by induction)