系別：資訊工程學系三年級      科目：離散數學

准帶項目請打「○」否則打「×」

| X | 簡單型計算機 |

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本試題共 1 頁

1. How many times is the printf statement executed for the following program segment. (Here, i, j, k and m are integer variables)       (16 pts)
```
for (i = 1; i <= 25; i++ )
    for (j = 1; j <= i; j++ )
        for (k = 1; k <= j; k++ )
            for (m = 1; m <= k; m++ )
                printf ("%d\n", i + j – k + m);
```

2. Determine the number of integer solutions for       (16 pts)

$$x_1 + x_2 + x_3 + x_4 + x_5 < 35$$

where $x_i \geq 0$, $1 \leq i \leq 3$, $x_4 \geq 3$ and $x_5 \geq 6$.

3. For all positive integer n, prove that       (16 pts)

$$\binom{2n}{n} = \sum_{i=0}^{n} \binom{n}{i}^2$$

4. Use a recurrence relation to derive the formula for       (16 pts)

$$\sum_{i=0}^{n} i^2$$

5. Determine the coefficient of $x^{17}$ in $(x^2 + x^3 + x^4 + \dots)^4$       (16 pts)

6. Solve the following recurrence relation.       (20 pts)

$$a_n = 6a_{n-1} - 9a_{n-2}, \quad n \geq 2, \quad a_0 = 3, \quad a_1 = -7$$