

系別：資訊工程學系三年級

科目：離散數學

准帶項目請打「V」

計算機

本試題共 7 大題， / 頁

1. Determine the number of integer solutions of $x_1 + x_2 + x_3 + x_4 = 7$, where $x_i \geq 0$ for all $1 \leq i \leq 4$. (15%)
2. Consider the following C program segment, where i, j , and k are integer variables.


```
for (i = 0; i < 20; i++)
    for (j = 0; j < i; j++)
        for (k = 0; k < j; k++)
            printf("%d\n", i*j+k);
```

 How many times is the `printf()` function executed in this program segment? (15%)
3. Prove that for every integer n , if n is odd, then n^2 is odd. (15%)
4. Prove that if 101 integers are selected from the set $S = \{1, 2, 3, \dots, 200\}$, then there are two integers such that one divides the other. (15%)
5. Solve the following recurrence relation: $2a_{n+2} - 11a_{n+1} + 5a_n, n \geq 0, a_0 = 2, a_1 = -8$. (15%)
6. Since $1 = (1-x)(1+x+x^2+x^3+\dots)$, $1/(1-x)$ is the generating function for the sequence 1, 1, 1, 1, Find the generating function for the sequence 0, 1, 2, 3, 4, (15%)
7. Find the generating function for the number of ways to select 10 candy bars from large supplies of six different kinds. (10%)