98 成功大學 程式設計

一、Data Structure

1. A

   $F_0(X) = 1$

   $F_1(X) = X$

   $F_2(X) = X^2 + 1$

   $F_3(X) = X^3 + 2X$

   $F_4(X) = X^4 + 3X^2 + 1$

   $F5(X) = X^4 + 4X^3 + 3X$

   所以 $F_n(X)$ 共需 $(\left\lfloor \frac{n}{2} \right\rfloor + 1) \fallingdotseq 2550$ 個

2. (a) F (b) F (c) T (d) F
3. (a)

```
void bridge ( int u, int v )
{
        node_pointer ptr;
        int w, x, y;
        dfn[u] = low[u] = num++;

        for( ptr = graph[u]; ptr; ptr = ptr->link )
        {
              w = ptr -> vertex;
              if( dfn[w] < 0 )
              {
                    bridge( w, u );
                    low[u] = MIN2( low[u], low[w] );
                    if ( low[w] > dfn[u] )
                    //low[w] > dfn[u], ( w, u )即為 bridge
                          printf( "%d%d\n", w, u );
              }
              else if( w != u )
                    low[u] = MIN2( low[u], dfn[w] );
        }
}
```

(b) O(v + e)

二、Algorithm

4.

$T(n) = T(n-1) + \frac{1}{n}$

$= T(n-2) + \frac{1}{n-1} + \frac{1}{n}$

=..........

$= T(0) + 1 + \frac{1}{2} + \cdots + \frac{1}{n-1} + \frac{1}{n}$

對 T(n)作 Big-O, Ω 的證明

可得’T(n) = θ(lgn)

5.

$$C[i, j] = \begin{cases} 0, \text{ if } i = 0 \text{ or } j = 0 \\ C[i-1, j-1], \text{ if } Xi = Yi \text{ 且 } i, j > 0 \\ \text{MAX}\{ C[i-1, j], C[i, j-1]\}, \text{ if } Xi \neq Yi \text{ 且 } i, j > 0 \end{cases}$$

6.

step1: 作 topological sort

step2: Initial-single-source(G, s);

step3: for each u by topological sort order

do for each v ∈ adj(u)

do d(v) <- min(d(v), d(u) + w(u, v));

Time Complexity : θ(|V|+|E|) + θ(|V|) + θ(|E|) = θ(|V|+|E|)

7,

(Notice, trace Horowitz 與 Cormen 的 Quicksort 所造成的結果會不同，在此以 Horowitz 的 Quicksort 解釋)

T(n) = T(n-1) + n

= T(n-2) + (n-1) + n

= ...

= 1 + 2 + 3 + ... + (n-1) + n

$=O(n^2)$