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Assignment - 2

Q1 MATRIX CHAIN MULTIPLICATION

```
int matmultiplication (int n, arr[])
{
    int t[n+1][n+1];
    for (int i = 0; i < n+1; i++)
    {
        for (int j = 0; j < n+1; j++)
        {
            t[i][j] = 0;
        }
    }

    for (int j = 2; j < n; j++)
    {
        int l = j;
        int i = 1;
        while (j < n)
        {
            int ans = INT_MAX;
            for (int k = i; k <= j-1; k++)
            {
                int c1 = t[i][k];
                int c2 = t[k+1][j];
                ans = min (c1 + c2 + (arr[i-1] * arr[j] * arr[k]), ans);
            }
            t[i][j] = ans;
            i++;
            j++;
        }
        j = l;
    }
    return t[1][n-1];
}
```


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Ex
arr[] = { 40, 20, 30, 10, 30 }

Initialization

m	0	A ₁	A ₂	A ₃	A ₄
0	0	0	0	0	0
A ₁	0	0			
A ₂	0	0	0		
A ₃	0	0	0	0	
A ₄	0	0	0	0	0

m	0	A ₁	A ₂	A ₃	A ₄
0	0	0	0	0	0
A ₁	0	0	24000	14000	26000
A ₂	0	0	0	6000	12000
A ₃	0	0	0	0	9000
A ₄	0	0	0	0	0

1st

$$m[1,2] = 40 \times 20 \times 30 + 0 + 0 = 24000$$

$$m[2,3] = 20 \times 30 \times 10 = 6000$$

$$m[3,4] = 30 \times 10 \times 30 = 9000$$

2nd

$$m[1,3] = \min \begin{cases} m[1,1] + m[2,3] + 40 \times 20 \times 10 = 0 + 6000 + 2000 \\ m[1,2] + m[3,3] + 40 \times 30 \times 10 = 24000 + 0 + 12000 \end{cases} = 14000$$

$$m[2,4] = \min \begin{cases} m[2,2] + m[3,4] + 20 \times 30 \times 30 = 0 + 9000 + 18000 \\ m[2,3] + m[4,4] + 20 \times 10 \times 30 = 6000 + 0 + 6000 \end{cases} = 12000$$

3rd

$$m[1,4] = \min \begin{cases} m[1,1] + m[2,4] + 40 \times 20 \times 30 = 0 + 12000 + 24000 \\ m[1,2] + m[3,4] + 40 \times 30 \times 30 = 24000 + 9000 + 36000 \\ m[1,3] + m[4,4] + 40 \times 10 \times 30 = 14000 + 0 + 12000 \end{cases} = 26000$$

min

$$\boxed{\text{ans} = t[1][n] = 26000}$$

Ans

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Q2 a) Knuth Morris Pratt String matching

Ex/Ip Pattern ababd

String a b a b c a b c a b a b a b d

Workflow

String ⁱ
a b a b c a b c a b a b a b d
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Pattern

0	1	2	3	4	5
a	b	a	b	d	
0	0	1	2	0	

i=0 j=0 s[i]==s[j+1] a==a j++, i++	i=9 j=1 s[i]==s[j+1] b==b i++, j++
i=1 j=1 s[i]==s[j+1] b==b j++, i++	i=10 j=2 s[i]==s[j+1] a==a i++ j++
i=2 j=2 s[i]==s[j+1] a==a j++, i++	i=11 j=3 s[i]==s[j+1] b==b i++ j++
i=3 j=3 s[i]==s[j+1] b==a j++ i++	i=12 j=4 s[i]!=s[j+1] d!=a j=P[j]=2
i=4 j=4 s[i]!=s[j+1] c!=d j=P[j]=2	i=12 j=2 s[i]==s[j+1] a==a j++ i++
i=4 j=2 s[i]!=s[j+1] c!=a j=P[j]=0, i++	i=13 j=3 s[i]==s[j+1] b==b i++, j++
i=5 j=0 s[i]==s[j+1] a==a j++, i++	i=14 j=4 s[i]==s[j+1] d==d j++, j++
i=6 j=1 s[i]==s[j+1] b==b i++, j++	
i=7 j=2 s[i]!=s[j+1] a!=c j=P[j]=0, i++	
i=8 j=0 s[i]==s[j+1] a==a j++, i++	

String match
successfully.
return.

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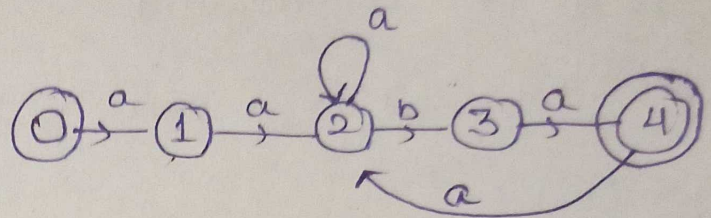
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b) Finite automata string matching

Text: A A B A A C A A D A A B A

Pattern: A A B A

State	A	B
0	① 0	A
1	② 0	A
2	2 ③	B
3	④ 0	A
4	⑤ 0	



A A B B
~~A A B~~
~~A B B~~

A A B A A
~~A A B A~~
~~A B A A~~

A A B A B

~~A A B A~~
~~A B A B~~

0 1 2 3 4 5 6 7 8 9 10 11 12
~~i~~ i
A A B A A C A A D A A B A

State i

1 0
2 2
3 3

4 4 string match.

5 0

6 1

7 2

8 0

9 1

10 2

11 3

12 4 string match