

ADVANCED ALGORITHMS

AIM: To implement rabin-karp
And KMP string matching
Algorithm.

ROLL NO: CE056

LAB NO: 03

1. Implement Rabin-Karp Algorithm for String Matching.

➤ **CODE:**

```
#include <iostream>
#include <stdlib.h>
#include <bits/stdc++.h>

#define ll long long

using namespace std;

ll power(ll a,ll n,ll mod){
    ll res=1;
    a=a%mod;
```

```

while(n>0){
    if(n&1)
        res=(res*a)%mod;
    n=n>>1;
    a=(a*a)%mod;
}
return res;
}

void rabinkarp(string text, string pattern, ll d, ll q)
{
    ll n=text.length(),m=pattern.length();
    ll t[n-m]={0};
    ll h=power(d,m-1,q),p=0,i;
    for(i=0;i<m;i++){
        p=(d*p+(pattern[i]-'0'))%q;
        t[0]=(d*t[0]+(text[i]-'0'))%q;
    }
    for(i=0;i<=(n-m);i++){
        if(p==t[i]){
            if(pattern==text.substr(i,m))
                cout<<"Pattern occurs with index:
"<<i<<"\n";
        }
        if(i<(n-m)){

```

```

            t[i+1]=((d*(t[i]-((text[i]-'0')*h))) +
(text[i+m]-'0'))%q;
            if(t[i+1]<0)
                t[i+1]=t[i+1]+q;
        }

    }
}

int main()
{
    string text_string,pattern;
    int radix;
    cout << "Please enter the text string: ";
    cin >> text_string;
    cout << "Pease enter the pattern: ";
    cin >> pattern;
    cout << "Enter the radix: ";
    cin >> radix;
    rabinkarp(text_string,pattern,radix,29);
    return 0;
}

```

```
aakarsh@aakarsh-VirtualBox:~/Desktop$ g++ rabinkarp.cpp
aakarsh@aakarsh-VirtualBox:~/Desktop$ ./a.out
Please enter the text string: abcabcdabd
Pease enter the pattern: abcdabd
Enter the radix27
Pattern occurs with index: 3
aakarsh@aakarsh-VirtualBox:~/Desktop$ g++ rabinkarp.cpp
aakarsh@aakarsh-VirtualBox:~/Desktop$ ./a.out
Please enter the text string: 1231212
Pease enter the pattern: 12
Enter the radix: 10
Pattern occurs with index: 0
Pattern occurs with index: 3
Pattern occurs with index: 5
```

2.Implement KMP Algorithm for String Matching.

➤CODE:

```
#include <iostream>
#include <stdlib.h>
#include <bits/stdc++.h>

using namespace std;

void kmp(string text,string pattern)
{
    int patternlength = pattern.length(),textlength =
text.length();
```

```

int prefixtable[patternlength+1],k=-1;
bool flag=false;
prefixtable[0] = -1;
//cout << pattern << endl;
for(int i=0; i<patternlength; i++)
{
    while(k>=0 && pattern[k]!=pattern[i])
    {
        k = prefixtable[k];
    }
    prefixtable[i+1] = ++k;
}
/*for(int i=0; i<= patternlength; i++)
    cout << prefixtable[i] << endl;*/
k=0;
for(int i=0;i < textlength;i++)
{
    //cout << "Inside for" << endl;
    while(k >= 0 && pattern[k] != text[i])
    {
        k = prefixtable[k];
    }
    k++;
    if(k == patternlength)
    {

```

```

        cout << "pattern match at text string
index " << i-patternlength+1 << endl;
        k = prefixtable[k];
        flag = true;
    }
}
if(flag == false)
{
    cout << "Pattern not found." << endl;
}
}

int main()
{
    string text_string,pattern;
    cout << "Please enter the text string: ";
    cin >> text_string;
    cout << "Pease enter the pattern: ";
    cin >> pattern;
    kmp(text_string,pattern);
    return 0;
}

```

```
aakarsh@aakarsh-VirtualBox:~/Desktop$ g++ kmp.cpp
aakarsh@aakarsh-VirtualBox:~/Desktop$ ./a.out
Please enter the text string: abcabcabcdabdabdabd
Pease enter the pattern: abcdabd
pattern match at text string index 6
pattern match at text string index 13
aakarsh@aakarsh-VirtualBox:~/Desktop$ ./a.out
Please enter the text string: aaaaaa
Pease enter the pattern: aa
pattern match at text string index 0
pattern match at text string index 1
pattern match at text string index 2
pattern match at text string index 3
aakarsh@aakarsh-VirtualBox:~/Desktop$ ./a.out
Please enter the text string: abc_abc
Pease enter the pattern: s
Pattern not found.
aakarsh@aakarsh-VirtualBox:~/Desktop$
```