PAGE REPLACEMENT ALGORITHMS
ROLL NO: 187156

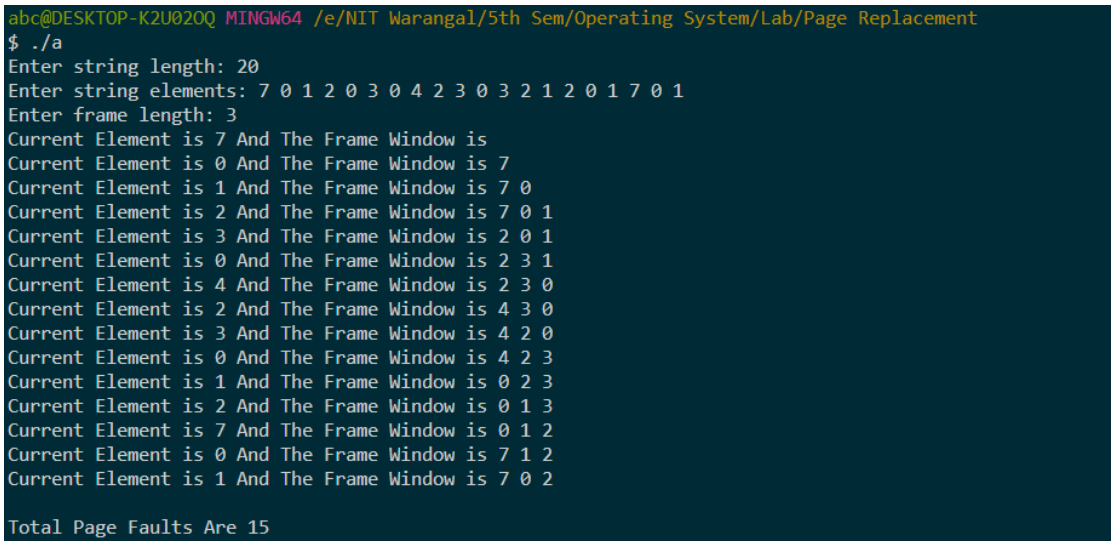
1. FIFO
Code:

```
#include<bits/stdc++.h>
using namespace std;
void display(vector<int>v)
{
	for(auto i:v)
		cout<<i<<" ";
	cout<<endl;
}
int solve(int A[], int n, int k)
{
	int cc = 0;
	vector<int>v1, v2;
	int i = 0;
	while(i < k)
	{
		for(int j=0;j<v2.size();j++)
			v2[j]++;
		if(find(v1.begin(), v1.end(), A[i]) ==
v1.end()){
			cout<<"Current Element is
"<<A[i]<<" And "<<"The Frame Window is ";
```

```
                display(v1);
                v1.push_back(A[i]);
                v2.push_back(1);
                cc++;
            }
            i++;
        }
        while(i<n)
        {

            for(int j=0;j<v2.size();j++)
                v2[j]++;

            if(find(v1.begin(), v1.end(), A[i]) ==
v1.end()){
                cout<<"Current Element is
"<<A[i]<<" And "<<"The Frame Window is ";
                display(v1);
                int m1 = -1, m2 = INT_MIN;
                for(int j=0;j<v2.size();j++){
                    if(v2[j] > m2){
                        m2 = v2[j];
                        m1 = j;
                    }
                }
                v1[m1] = A[i];
                v2[m1] = 1;
                cc++;
```

```
            }
            i++;
        }
        return cc;
}
int main()
{
        int n;
        cout<<"Enter string length: ";
        cin>>n;
        int A[n];
        cout<<"Enter string elements: ";
        for(int i=0;i<n;i++)
        {
            cin>>A[i];
        }

        cout<<"Enter frame length: ";
        int k;
        cin>>k;
        cout<<"\nTotal Page Faults Are "<<solve(A, n,
k);
        return 0;
}
```

Output:



2. Optimal

Code:

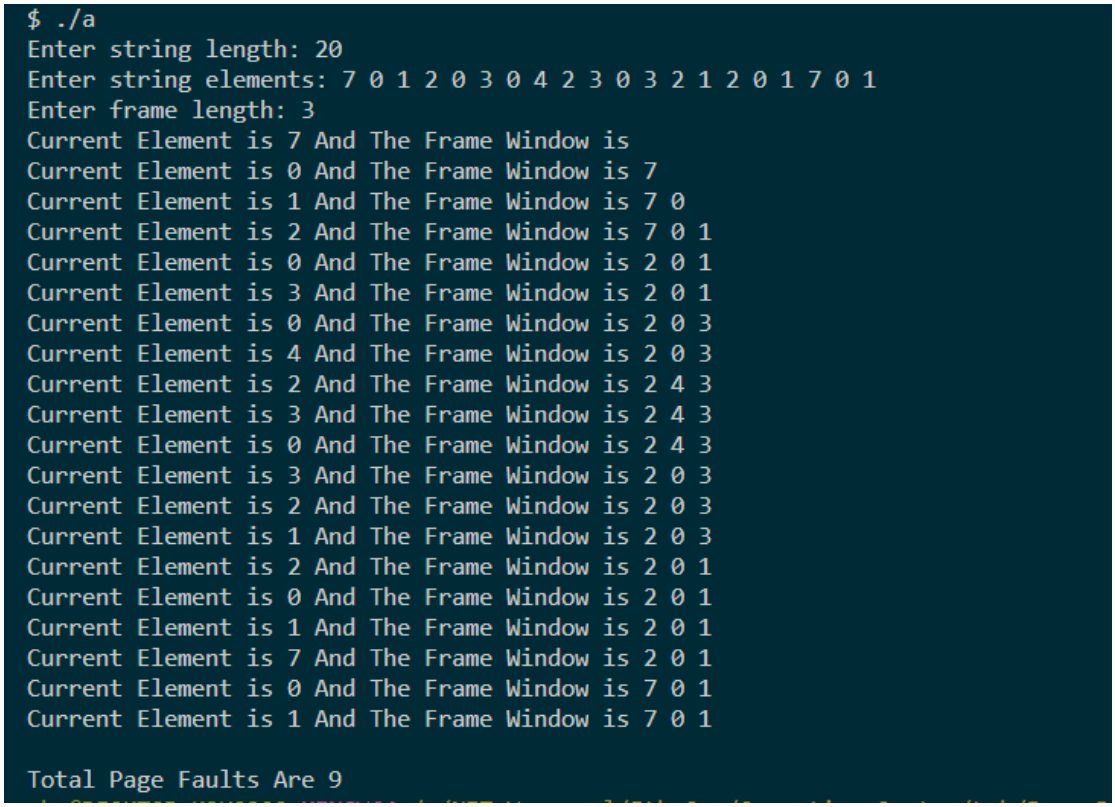
```
#include<bits/stdc++.h>
using namespace std;
void display(vector<int>v)
{
	for(auto i:v)
		cout<<i<<" ";
	cout<<endl;
}
int solve(int A[], int n, int k)
{
	int cc = 0;
	map<int, vector<int>>mp;
	map<int, vector<int>>::iterator it;
	for(int i=0;i<n;i++)
	{
```

```
            mp[A[i]].push_back(i);
        }
        for(it = mp.begin();it != mp.end();it++)
        {
            it->second.push_back(100);
        }

        vector<int>v1;
        int i = 0;
        while(v1.size() < k)
        {
            if(find(v1.begin(), v1.end(), A[i]) ==
v1.end()){
                cout<<"Current Element is
"<<A[i]<<" And "<<"The Frame Window is ";
                for(int j=0;j<v1.size();j++){
                    cout<<v1[j]<<" ";
                }
                cout<<endl;
                v1.push_back(A[i]);
                cc++;
            }
            i++;
        }

        while(i<n){
            cout<<"Current Element is "<<A[i]<<"
And "<<"The Frame Window is ";
```

```
            for(int j=0;j<v1.size();j++){
                cout<<v1[j]<<" ";
            }
            cout<<endl;

            if(find(v1.begin(), v1.end(), A[i]) ==
v1.end()){
                cc++;
                int m1 = -1, m2 = INT_MIN;


                for(int j=0;j<v1.size();j++){
                    int m3 = 0;
                    for(int
l=0;l<mp[v1[j]].size();l++){
                        if(mp[v1[j]][l] > i){
                            m3 = mp[v1[j]][l];
                            break;
                        }
                    }
                    // cout<<v1[j]<<"->"<<m3<<",
"<<m2<<endl;
                    if(m3 > m2){
                        m2 = m3;
                        m1 = j;
                    }
                }
                // cout<<"Max is "<<m1<<endl;
```

```
                v1[m1] = A[i];
            }
            i++;
        }
        return cc;
}
int main()
{
        int n;
        cout<<"Enter string length: ";
        cin>>n;
        int A[n];
        cout<<"Enter string elements: ";
        for(int i=0;i<n;i++)
        {
            cin>>A[i];
        }
        cout<<"Enter frame length: ";
        int k;
        cin>>k;
        cout<<"\nTotal Page Faults Are "<<solve(A, n,
k);
        return 0;
}
```

Output:



3. Least Recently Used (LRU)

Code:

```
#include<bits/stdc++.h>
using namespace std;

void display(list<int>l)
{
	cout<<"Frame window is ";
	for(auto i:l)
		cout<<i<<" ";
	cout<<endl;
}
int solve(int A[], int n, int k)
```

```
{
	int cc = 0;
	list<int>l;
	map<int, list<int>::iterator>mp;
	for(int i=0;i<n;i++)
	{

		if(mp.find(A[i]) == mp.end())
		{
			cout<<"Element is "<<A[i]<<" And ";
			display(l);
			cc++;
			if(l.size() == k)
			{
				int last = l.back();
				l.pop_back();
				mp.erase(last);
			}
		}
		else
		{
			l.erase(mp[A[i]]);
		}
		l.push_front(A[i]);
		mp[A[i]] = l.begin();

	}
	return cc;
```

```
}
int main()
{
	int n;
	cout<<"Enter string length: ";
	cin>>n;
	int A[n];
	cout<<"Enter string elements: ";
	for(int i=0;i<n;i++)
	{
		cin>>A[i];
	}
	cout<<"Enter frame length: ";
	int k;
	cin>>k;
	cout<<"\nTotal Page Faults Are "<<solve(A, n,
k);
	return 0;
}
```

Output:

```
abc@DESKTOP-K2U02OQ MINGW64 /e/NIT Warangal/5th Sem/Operating System/Lab/Page Replacement
$ ./a
Enter string length: 20
Enter string elements: 7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1
Enter frame length: 3
Element is 7 And Frame window is
Element is 0 And Frame window is 7
Element is 1 And Frame window is 0 7
Element is 2 And Frame window is 1 0 7
Element is 3 And Frame window is 0 2 1
Element is 4 And Frame window is 0 3 2
Element is 2 And Frame window is 4 0 3
Element is 3 And Frame window is 2 4 0
Element is 0 And Frame window is 3 2 4
Element is 1 And Frame window is 2 3 0
Element is 0 And Frame window is 2 1 3
Element is 7 And Frame window is 1 0 2

Total Page Faults Are 12
```