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//CD Practical Assignment 1:
//Write a program in C++ to implement a lexical analyzer
//that should recognize identifiers, operators, keywords and separators.
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//Roll number: 090

//Lexical Analyser implementation in C++ for C++ tokens analysis

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

using namespace std;

//this is a function which returns 1 if buffer is one of the following function
int isFunction(string buffer)
{
    //Pre-defined functions
    string funName[5] = {"printf","scanf", "cin", "cout"};
    int flag = 0;
    for(int i = 0; i < 5; ++i)
    {
        if(funName[i] == buffer)
        {
            flag = 1;//buffer is a pre-defined function
            break;
        }
    }
    return flag;
}

//this is a function which returns 1 if buffer is one of the following keyword
int isKeyword(string buffer)
{
    //Buffer is a Keyword in C++
    string keywords[63] = {"auto","break","case","char","const","continue","default",
                            "do","double","else","enum","extern","float","for","goto",
                            "if","int","long","register","return","short","signed",
                            "sizeof","static","struct","switch","typedef","union",
                            "unsigned","void","volatile","while",
                            "asm",  "dynamic_cast", "namespace","reinterpret_cast", "bool"
                            "explicit", "new",  "static_cast",  "false",    "catch",
                            "operator", "template", "friend",   "private",  "class",
                            "this", "inline",   "public",   "throw",    "const_cast",
                            "delete",   "mutable",  "protected",    "true", "try",
                            "typeid",   "typename", "using",    "virtual",  "wchar_t"
                        };
    int flag = 0;

    for(int i = 0; i < 63; ++i)
    {
        if(keywords[i] == buffer)
        {
            flag = 1;//keyword found
            break;
        }
    }

    return flag;
}

//this is a function which returns 1 if buffer is one of the following prefix
int isPrefix(string buffer)
{

    string prefix[3] = {"std","chrono"};
    int flag = 0;

    for(int i = 0; i < 2; ++i)
    {
        if(prefix[i] == buffer)
        {
            flag = 1;//prefix found
            break;
        }
    }

    return flag;
}

int main()
{
    char ch;
    string buffer = "";//iterate over tokens of the text file
    string operators = "+-*/%=";//operators
    string num = "0123456789";//numbers
    ifstream fin("program.txt");

    int j=0;
    cout<<"\n\t\tCOMPILER DESIGN: Assignment 1\n\t";
    cout<<"Lexical Analyser implementation in C++ for C++ tokens analysis\n\n";
    if(!fin.is_open())
    {
        cout<<"\tError occured while opening the file!\n";
        exit(0);
    }

    int stringFlag = 0;

    while(!fin.eof())
    {
        ch = fin.get();

        for(int i = 0; i < 6; i++)
        {
            if(ch == operators[i])
            {
                cout<<"\t"<<ch<<"\t\t\t is a OPERATOR\n";
                continue;
            }
```

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}

for(int i = 0; i < 10; i++)
{
    if(ch == num[i])
    {
        cout<<"\t"<<ch<<"\t\t\t is a NUMBER\n";
        continue;
    }
}

if(ch == ';')
{
    cout<<"\t"<<ch<<"\t\t\t is a SEPARATOR\n";
    continue;
}

if(ch == '{')
{
    cout<<"\t"<<ch<<"\t\t\t is a OPEN CURLY BRACKET\n";
    continue;
}

if(ch == '}')
{
    cout<<"\t"<<ch<<"\t\t\t is a CLOSE CURLY BRACKET\n";
    continue;
}

if(ch == '(')
{
    cout<<"\t"<<ch<<"\t\t\t is a OPEN BRACKET\n";
    continue;
}

if(ch == ')')
{
    cout<<"\t"<<ch<<"\t\t\t is a CLOSED BRACKET\n";
    continue;
}


if(ch == '\"' || ch == '#' || ch == '<'|| ch == '>'|| ch == '.' || isalnum(ch))
{
    buffer += ch;
}
else if((ch == ' ' || ch == '\n' || ch == ';') && (buffer.length() != 0))
{
        // buffer += '\0';
        // j = 0;
        if(isKeyword(buffer) == 1)
        {
            cout<<"\t"<<buffer<<"\t\t\t is a KEYWORD\n";
        }
        else if(isPrefix(buffer) == 1)
```

```
                {
                    cout<<"\t"<<buffer<<"\t\t\t is a PREFIX\n";
                }
                else if(isFunction(buffer) == 1)
                {
                    cout<<"\t"<<buffer<<"\t\t\t is a FUNCTION\n";
                }
                else if(buffer[0] == '\"')
                {
                    cout<<"\t"<<buffer<<"\t\t\t is a STRING\n";
                }
                else if(buffer[0] == '#')
                {
                    cout<<"\t"<<buffer<<"\t\t\t is a HEADER FILE\n";
                }
                else
                {
                    cout<<"\t"<<buffer<<"\t\t\t is a IDENTIFIER/VARIABLE\n";
                }
                buffer = "";
        }

    }

    fin.close();

    return 0;
}


/*
Output: For OS Page Replacement Algorithm cpp program


                COMPILER DESIGN: Assignment 1
        Lexical Analyser implementation in C++ for C++ tokens analysis

        /                        is a OPERATOR
        /                        is a OPERATOR
        OS                       is a IDENTIFIER/VARIABLE
        Lab                      is a IDENTIFIER/VARIABLE
        Assignment                       is a IDENTIFIER/VARIABLE
        Page                     is a IDENTIFIER/VARIABLE
        Replacement                      is a IDENTIFIER/VARIABLE
        Algorithm.                       is a IDENTIFIER/VARIABLE
        /                        is a OPERATOR
        /                        is a OPERATOR
        By                       is a IDENTIFIER/VARIABLE
        Sanskar                  is a IDENTIFIER/VARIABLE
        Sharma                   is a IDENTIFIER/VARIABLE
        /                        is a OPERATOR
        /                        is a OPERATOR
        PRN                      is a IDENTIFIER/VARIABLE
        0                        is a NUMBER
        1                        is a NUMBER
```

```
2                       is a NUMBER
0                       is a NUMBER
1                       is a NUMBER
8                       is a NUMBER
0                       is a NUMBER
3                       is a NUMBER
8                       is a NUMBER
1                       is a NUMBER
0120180381                      is a IDENTIFIER/VARIABLE
/                       is a OPERATOR
/                       is a OPERATOR
Roll                    is a IDENTIFIER/VARIABLE
Number                  is a IDENTIFIER/VARIABLE
0                       is a NUMBER
9                       is a NUMBER
0                       is a NUMBER
090                     is a IDENTIFIER/VARIABLE
#include                        is a HEADER FILE
/                       is a OPERATOR
+                       is a OPERATOR
+                       is a OPERATOR
<bitsstdc.h>                    is a IDENTIFIER/VARIABLE
#include                        is a HEADER FILE
<set>                   is a IDENTIFIER/VARIABLE
#include                        is a HEADER FILE
<unorderedset>                  is a IDENTIFIER/VARIABLE
using                   is a KEYWORD
namespace                       is a KEYWORD
;                       is a SEPARATOR
std                     is a PREFIX
void                    is a KEYWORD
(                       is a OPEN BRACKET
printqueuequeue<int>                    is a IDENTIFIER/VARIABLE
)                       is a CLOSED BRACKET
q                       is a IDENTIFIER/VARIABLE
{                       is a OPEN CURLY BRACKET
while                   is a KEYWORD
(                       is a OPEN BRACKET
(                       is a OPEN BRACKET
)                       is a CLOSED BRACKET
)                       is a CLOSED BRACKET
q.empty                 is a IDENTIFIER/VARIABLE
{                       is a OPEN CURLY BRACKET
cout                    is a FUNCTION
<<                      is a IDENTIFIER/VARIABLE
(                       is a OPEN BRACKET
)                       is a CLOSED BRACKET
q.front<<"                      is a IDENTIFIER/VARIABLE
<                       is a IDENTIFIER/VARIABLE
;                       is a SEPARATOR
"                       is a STRING
(                       is a OPEN BRACKET
)                       is a CLOSED BRACKET
;                       is a SEPARATOR
q.pop                   is a IDENTIFIER/VARIABLE
}                        is a CLOSE CURLY BRACKET
cout                     is a FUNCTION
<<                       is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
endl                     is a IDENTIFIER/VARIABLE
}                        is a CLOSE CURLY BRACKET
bool                     is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
checkValuequeue<int>                     is a IDENTIFIER/VARIABLE
q                        is a IDENTIFIER/VARIABLE
int                      is a KEYWORD
)                        is a CLOSED BRACKET
temp                     is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
bool                     is a IDENTIFIER/VARIABLE
t                        is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
0                        is a NUMBER
;                        is a SEPARATOR
0                        is a IDENTIFIER/VARIABLE
while                    is a KEYWORD
(                        is a OPEN BRACKET
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
)                        is a CLOSED BRACKET
q.empty                  is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
(                        is a OPEN BRACKET
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
ifq.front                        is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
=                        is a OPERATOR
)                        is a CLOSED BRACKET
{                        is a OPEN CURLY BRACKET
temp                     is a IDENTIFIER/VARIABLE
t                        is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
1                        is a NUMBER
;                        is a SEPARATOR
1                        is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
break                    is a KEYWORD
}                        is a CLOSE CURLY BRACKET
{                        is a OPEN CURLY BRACKET
else                     is a KEYWORD
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
q.pop                    is a IDENTIFIER/VARIABLE
}                        is a CLOSE CURLY BRACKET
}                        is a CLOSE CURLY BRACKET
return                   is a KEYWORD
;                        is a SEPARATOR
t                        is a IDENTIFIER/VARIABLE
```

```
}                        is a CLOSE CURLY BRACKET
/                        is a OPERATOR
/                        is a OPERATOR
FIFO                     is a IDENTIFIER/VARIABLE
Page                     is a IDENTIFIER/VARIABLE
Replacement                      is a IDENTIFIER/VARIABLE
Algorithm                        is a IDENTIFIER/VARIABLE
void                     is a KEYWORD
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
{                        is a OPEN CURLY BRACKET
FIFO                     is a IDENTIFIER/VARIABLE
int                      is a KEYWORD
index                    is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
-                        is a OPERATOR
1                        is a NUMBER
;                        is a SEPARATOR
1                        is a IDENTIFIER/VARIABLE
int                      is a KEYWORD
n                        is a IDENTIFIER/VARIABLE
frame                    is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
0                        is a NUMBER
=                        is a OPERATOR
0                        is a NUMBER
;                        is a SEPARATOR
;                        is a SEPARATOR
temppagef0hits0                  is a IDENTIFIER/VARIABLE
cout<<"tttEnter                  is a IDENTIFIER/VARIABLE
the                      is a IDENTIFIER/VARIABLE
number                   is a IDENTIFIER/VARIABLE
of                       is a IDENTIFIER/VARIABLE
reference                        is a IDENTIFIER/VARIABLE
frame                    is a IDENTIFIER/VARIABLE
slots                    is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
separated                        is a IDENTIFIER/VARIABLE
by                       is a IDENTIFIER/VARIABLE
)                        is a CLOSED BRACKET
spaces                   is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
"                        is a STRING
;                        is a SEPARATOR
cin>>n>>frame                    is a IDENTIFIER/VARIABLE
queue                    is a IDENTIFIER/VARIABLE
<int>                    is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
q                        is a IDENTIFIER/VARIABLE
cout<<"tttEnter                  is a IDENTIFIER/VARIABLE
the                      is a IDENTIFIER/VARIABLE
page                     is a IDENTIFIER/VARIABLE
reference                        is a IDENTIFIER/VARIABLE
in                       is a IDENTIFIER/VARIABLE
sequence                         is a IDENTIFIER/VARIABLE
```

```
(                        is a OPEN BRACKET
separated                        is a IDENTIFIER/VARIABLE
by                       is a IDENTIFIER/VARIABLE
)                        is a CLOSED BRACKET
spaces                   is a IDENTIFIER/VARIABLE
nttt                     is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
"                        is a STRING
(                        is a OPEN BRACKET
forint                   is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
0                        is a NUMBER
;                        is a SEPARATOR
;                        is a SEPARATOR
+                        is a OPERATOR
+                        is a OPERATOR
)                        is a CLOSED BRACKET
{                        is a OPEN CURLY BRACKET
i0i<ni                   is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
cin>>temp                        is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
(                        is a OPEN BRACKET
ifcheckValueq                    is a IDENTIFIER/VARIABLE
)                        is a CLOSED BRACKET
)                        is a CLOSED BRACKET
{                        is a OPEN CURLY BRACKET
temp                     is a IDENTIFIER/VARIABLE
+                        is a OPERATOR
+                        is a OPERATOR
;                        is a SEPARATOR
hits                     is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
continue                         is a KEYWORD
}                        is a CLOSE CURLY BRACKET
{                        is a OPEN CURLY BRACKET
else                     is a KEYWORD
+                        is a OPERATOR
+                        is a OPERATOR
;                        is a SEPARATOR
pagef                    is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
=                        is a OPERATOR
-                        is a OPERATOR
1                        is a NUMBER
)                        is a CLOSED BRACKET
{                        is a OPEN CURLY BRACKET
ifindex>frame1                   is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
q.pop                    is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
q.pushtemp                       is a IDENTIFIER/VARIABLE
}                        is a CLOSE CURLY BRACKET
{                        is a OPEN CURLY BRACKET
else                     is a KEYWORD
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
q.pushtemp                       is a IDENTIFIER/VARIABLE
+                        is a OPERATOR
+                        is a OPERATOR
;                        is a SEPARATOR
index                    is a IDENTIFIER/VARIABLE
}                        is a CLOSE CURLY BRACKET
}                        is a CLOSE CURLY BRACKET
/                        is a OPERATOR
/                        is a OPERATOR
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
printqueueq                      is a IDENTIFIER/VARIABLE
/                        is a OPERATOR
/                        is a OPERATOR
cout<<"Index                     is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
"<<index<<endl                   is a STRING
}                        is a CLOSE CURLY BRACKET
cout<<"ntPage                    is a IDENTIFIER/VARIABLE
Faults                   is a IDENTIFIER/VARIABLE
"<<pagef<<                       is a STRING
"ntHits                  is a STRING
;                        is a SEPARATOR
"<<hits<<"n"                     is a STRING
}                        is a CLOSE CURLY BRACKET
bool                     is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
searchint                        is a IDENTIFIER/VARIABLE
key                      is a IDENTIFIER/VARIABLE
vector<int>                      is a IDENTIFIER/VARIABLE
)                        is a CLOSED BRACKET
fr                       is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
for                      is a KEYWORD
(                        is a OPEN BRACKET
int                      is a KEYWORD
i                        is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
0                        is a NUMBER
;                        is a SEPARATOR
0                        is a IDENTIFIER/VARIABLE
i                        is a IDENTIFIER/VARIABLE
<                        is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
fr.size                  is a IDENTIFIER/VARIABLE
```

```
+                        is a OPERATOR
+                        is a OPERATOR
)                        is a CLOSED BRACKET
i                        is a IDENTIFIER/VARIABLE
if                       is a KEYWORD
(                        is a OPEN BRACKET
fri                      is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
=                        is a OPERATOR
)                        is a CLOSED BRACKET
key                      is a IDENTIFIER/VARIABLE
return                   is a KEYWORD
;                        is a SEPARATOR
true                     is a KEYWORD
return                   is a KEYWORD
;                        is a SEPARATOR
false                    is a KEYWORD
}                        is a CLOSE CURLY BRACKET
int                      is a KEYWORD
(                        is a OPEN BRACKET
predictint                       is a IDENTIFIER/VARIABLE
pg                       is a IDENTIFIER/VARIABLE
vector<int>                      is a IDENTIFIER/VARIABLE
fr                       is a IDENTIFIER/VARIABLE
int                      is a KEYWORD
pn                       is a IDENTIFIER/VARIABLE
int                      is a KEYWORD
)                        is a CLOSED BRACKET
index                    is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
int                      is a KEYWORD
res                      is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
-                        is a OPERATOR
1                        is a NUMBER
1                        is a IDENTIFIER/VARIABLE
farthest                         is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
;                        is a SEPARATOR
index                    is a IDENTIFIER/VARIABLE
for                      is a KEYWORD
(                        is a OPEN BRACKET
int                      is a KEYWORD
i                        is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
0                        is a NUMBER
;                        is a SEPARATOR
0                        is a IDENTIFIER/VARIABLE
i                        is a IDENTIFIER/VARIABLE
<                        is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
fr.size                  is a IDENTIFIER/VARIABLE
+                        is a OPERATOR
+                        is a OPERATOR
)                        is a CLOSED BRACKET
i                        is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
int                      is a KEYWORD
;                        is a SEPARATOR
j                        is a IDENTIFIER/VARIABLE
for                      is a KEYWORD
(                        is a OPEN BRACKET
j                        is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
;                        is a SEPARATOR
index                    is a IDENTIFIER/VARIABLE
j                        is a IDENTIFIER/VARIABLE
<                        is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
pn                       is a IDENTIFIER/VARIABLE
+                        is a OPERATOR
+                        is a OPERATOR
)                        is a CLOSED BRACKET
j                        is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
if                       is a KEYWORD
(                        is a OPEN BRACKET
fri                      is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
=                        is a OPERATOR
)                        is a CLOSED BRACKET
pgj                      is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
if                       is a KEYWORD
(                        is a OPEN BRACKET
j                        is a IDENTIFIER/VARIABLE
>                        is a IDENTIFIER/VARIABLE
)                        is a CLOSED BRACKET
farthest                         is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
farthest                         is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
;                        is a SEPARATOR
j                        is a IDENTIFIER/VARIABLE
res                      is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
;                        is a SEPARATOR
i                        is a IDENTIFIER/VARIABLE
}                        is a CLOSE CURLY BRACKET
;                        is a SEPARATOR
break                    is a KEYWORD
}                        is a CLOSE CURLY BRACKET
}                        is a CLOSE CURLY BRACKET
if                       is a KEYWORD
(                        is a OPEN BRACKET
j                        is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
=                        is a OPERATOR
)                        is a CLOSED BRACKET
pn                       is a IDENTIFIER/VARIABLE
return                   is a KEYWORD
;                        is a SEPARATOR
i                        is a IDENTIFIER/VARIABLE
}                        is a CLOSE CURLY BRACKET
return                   is a KEYWORD
(                        is a OPEN BRACKET
res                      is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
=                        is a OPERATOR
-                        is a OPERATOR
1                        is a NUMBER
)                        is a CLOSED BRACKET
1                        is a IDENTIFIER/VARIABLE
0                        is a NUMBER
0                        is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
res                      is a IDENTIFIER/VARIABLE
}                        is a CLOSE CURLY BRACKET
/                        is a OPERATOR
/                        is a OPERATOR
Optimal                  is a IDENTIFIER/VARIABLE
Page                     is a IDENTIFIER/VARIABLE
Replacement                      is a IDENTIFIER/VARIABLE
Algorithm.                       is a IDENTIFIER/VARIABLE
void                     is a KEYWORD
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
Optimal                  is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
vector<int>                      is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
F                        is a IDENTIFIER/VARIABLE
int                      is a KEYWORD
hit                      is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
0                        is a NUMBER
;                        is a SEPARATOR
0                        is a IDENTIFIER/VARIABLE
int                      is a KEYWORD
;                        is a SEPARATOR
nframe                   is a IDENTIFIER/VARIABLE
cout<<"tttEnter                  is a IDENTIFIER/VARIABLE
the                      is a IDENTIFIER/VARIABLE
number                   is a IDENTIFIER/VARIABLE
of                       is a IDENTIFIER/VARIABLE
reference                        is a IDENTIFIER/VARIABLE
frame                    is a IDENTIFIER/VARIABLE
slots                    is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
separated                        is a IDENTIFIER/VARIABLE
by                       is a IDENTIFIER/VARIABLE
)                        is a CLOSED BRACKET
spaces                   is a IDENTIFIER/VARIABLE
```

```
;                        is a SEPARATOR
"                        is a STRING
;                        is a SEPARATOR
cin>>n>>frame                    is a IDENTIFIER/VARIABLE
int                      is a KEYWORD
;                        is a SEPARATOR
pagen                    is a IDENTIFIER/VARIABLE
cout<<"tttEnter                  is a IDENTIFIER/VARIABLE
the                      is a IDENTIFIER/VARIABLE
page                     is a IDENTIFIER/VARIABLE
reference                        is a IDENTIFIER/VARIABLE
in                       is a IDENTIFIER/VARIABLE
sequence                         is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
separated                        is a IDENTIFIER/VARIABLE
by                       is a IDENTIFIER/VARIABLE
)                        is a CLOSED BRACKET
spaces                   is a IDENTIFIER/VARIABLE
nttt                     is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
"                        is a STRING
(                        is a OPEN BRACKET
forint                   is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
0                        is a NUMBER
;                        is a SEPARATOR
;                        is a SEPARATOR
+                        is a OPERATOR
+                        is a OPERATOR
)                        is a CLOSED BRACKET
{                        is a OPEN CURLY BRACKET
i0i<ni                   is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
cin>>pagei                       is a IDENTIFIER/VARIABLE
}                        is a CLOSE CURLY BRACKET
for                      is a KEYWORD
(                        is a OPEN BRACKET
int                      is a KEYWORD
=                        is a OPERATOR
0                        is a NUMBER
;                        is a SEPARATOR
;                        is a SEPARATOR
+                        is a OPERATOR
+                        is a OPERATOR
)                        is a CLOSED BRACKET
i0i<ni                   is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
if                       is a KEYWORD
(                        is a OPEN BRACKET
(                        is a OPEN BRACKET
searchpagei                      is a IDENTIFIER/VARIABLE
)                        is a CLOSED BRACKET
)                        is a CLOSED BRACKET
F                        is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
+                        is a OPERATOR
+                        is a OPERATOR
;                        is a SEPARATOR
hit                      is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
continue                         is a KEYWORD
}                        is a CLOSE CURLY BRACKET
if                       is a KEYWORD
(                        is a OPEN BRACKET
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
F.size                   is a IDENTIFIER/VARIABLE
<                        is a IDENTIFIER/VARIABLE
)                        is a CLOSED BRACKET
frame                    is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
F.pushbackpagei                  is a IDENTIFIER/VARIABLE
else                     is a KEYWORD
{                        is a OPEN CURLY BRACKET
int                      is a KEYWORD
j                        is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
(                        is a OPEN BRACKET
predictpage                      is a IDENTIFIER/VARIABLE
F                        is a IDENTIFIER/VARIABLE
n                        is a IDENTIFIER/VARIABLE
i                        is a IDENTIFIER/VARIABLE
+                        is a OPERATOR
1                        is a NUMBER
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
1                        is a IDENTIFIER/VARIABLE
Fj                       is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
;                        is a SEPARATOR
pagei                    is a IDENTIFIER/VARIABLE
}                        is a CLOSE CURLY BRACKET
}                        is a CLOSE CURLY BRACKET
cout<<"ntPage                    is a IDENTIFIER/VARIABLE
Faults                   is a IDENTIFIER/VARIABLE
-                        is a OPERATOR
"<<nhit<<                        is a STRING
"ntHits                  is a STRING
;                        is a SEPARATOR
"<<hit<<"n"                      is a STRING
}                        is a CLOSE CURLY BRACKET
/                        is a OPERATOR
/                        is a OPERATOR
Least                    is a IDENTIFIER/VARIABLE
Recently                         is a IDENTIFIER/VARIABLE
Used                     is a IDENTIFIER/VARIABLE
Algorithm.                       is a IDENTIFIER/VARIABLE
void                     is a KEYWORD
```

```
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
Least                    is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
int                      is a KEYWORD
n                        is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
0                        is a NUMBER
;                        is a SEPARATOR
framepagef0                      is a IDENTIFIER/VARIABLE
cout<<"tttEnter                  is a IDENTIFIER/VARIABLE
the                      is a IDENTIFIER/VARIABLE
number                   is a IDENTIFIER/VARIABLE
of                       is a IDENTIFIER/VARIABLE
reference                        is a IDENTIFIER/VARIABLE
frame                    is a IDENTIFIER/VARIABLE
slots                    is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
separated                        is a IDENTIFIER/VARIABLE
by                       is a IDENTIFIER/VARIABLE
)                        is a CLOSED BRACKET
spaces                   is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
"                        is a STRING
;                        is a SEPARATOR
cin>>n>>frame                    is a IDENTIFIER/VARIABLE
int                      is a KEYWORD
;                        is a SEPARATOR
pagesn                   is a IDENTIFIER/VARIABLE
cout<<"tttEnter                  is a IDENTIFIER/VARIABLE
the                      is a IDENTIFIER/VARIABLE
page                     is a IDENTIFIER/VARIABLE
reference                        is a IDENTIFIER/VARIABLE
in                       is a IDENTIFIER/VARIABLE
sequence                         is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
separated                        is a IDENTIFIER/VARIABLE
by                       is a IDENTIFIER/VARIABLE
)                        is a CLOSED BRACKET
spaces                   is a IDENTIFIER/VARIABLE
nttt                     is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
"                        is a STRING
(                        is a OPEN BRACKET
forint                   is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
0                        is a NUMBER
;                        is a SEPARATOR
;                        is a SEPARATOR
+                        is a OPERATOR
+                        is a OPERATOR
)                        is a CLOSED BRACKET
{                        is a OPEN CURLY BRACKET
i0i<ni                   is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
```

```
cin>>pagesi                     is a IDENTIFIER/VARIABLE
}                       is a CLOSE CURLY BRACKET
unorderedset                    is a IDENTIFIER/VARIABLE
<int>                   is a IDENTIFIER/VARIABLE
;                       is a SEPARATOR
s                       is a IDENTIFIER/VARIABLE
unorderedmap<int                        is a IDENTIFIER/VARIABLE
int>                    is a IDENTIFIER/VARIABLE
;                       is a SEPARATOR
indexes                 is a IDENTIFIER/VARIABLE
for                     is a KEYWORD
(                       is a OPEN BRACKET
int                     is a KEYWORD
=                       is a OPERATOR
0                       is a NUMBER
;                       is a SEPARATOR
i0                      is a IDENTIFIER/VARIABLE
;                       is a SEPARATOR
i<n                     is a IDENTIFIER/VARIABLE
+                       is a OPERATOR
+                       is a OPERATOR
)                       is a CLOSED BRACKET
i                       is a IDENTIFIER/VARIABLE
{                       is a OPEN CURLY BRACKET
if                      is a KEYWORD
(                       is a OPEN BRACKET
(                       is a OPEN BRACKET
)                       is a CLOSED BRACKET
s.size                  is a IDENTIFIER/VARIABLE
<                       is a IDENTIFIER/VARIABLE
)                       is a CLOSED BRACKET
frame                   is a IDENTIFIER/VARIABLE
{                       is a OPEN CURLY BRACKET
if                      is a KEYWORD
(                       is a OPEN BRACKET
(                       is a OPEN BRACKET
)                       is a CLOSED BRACKET
=                       is a OPERATOR
=                       is a OPERATOR
(                       is a OPEN BRACKET
)                       is a CLOSED BRACKET
)                       is a CLOSED BRACKET
s.findpagesis.end                       is a IDENTIFIER/VARIABLE
{                       is a OPEN CURLY BRACKET
(                       is a OPEN BRACKET
)                       is a CLOSED BRACKET
;                       is a SEPARATOR
s.insertpagesi                  is a IDENTIFIER/VARIABLE
+                       is a OPERATOR
+                       is a OPERATOR
;                       is a SEPARATOR
pagef                   is a IDENTIFIER/VARIABLE
}                       is a CLOSE CURLY BRACKET
indexespagesi                   is a IDENTIFIER/VARIABLE
=                       is a OPERATOR
```

```
;                        is a SEPARATOR
i                        is a IDENTIFIER/VARIABLE
}                        is a CLOSE CURLY BRACKET
else                     is a KEYWORD
{                        is a OPEN CURLY BRACKET
if                       is a KEYWORD
(                        is a OPEN BRACKET
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
s.findpagesi                     is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
=                        is a OPERATOR
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
)                        is a CLOSED BRACKET
s.end                    is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
int                      is a KEYWORD
lru                      is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
INTMAX                   is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
val                      is a IDENTIFIER/VARIABLE
for                      is a KEYWORD
(                        is a OPEN BRACKET
auto                     is a KEYWORD
=                        is a OPERATOR
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
its.begin                        is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
its.end                  is a IDENTIFIER/VARIABLE
+                        is a OPERATOR
+                        is a OPERATOR
)                        is a CLOSED BRACKET
it                       is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
if                       is a KEYWORD
(                        is a OPEN BRACKET
*                        is a OPERATOR
indexesit                        is a IDENTIFIER/VARIABLE
<                        is a IDENTIFIER/VARIABLE
)                        is a CLOSED BRACKET
lru                      is a IDENTIFIER/VARIABLE
{                        is a OPEN CURLY BRACKET
lru                      is a IDENTIFIER/VARIABLE
=                        is a OPERATOR
*                        is a OPERATOR
;                        is a SEPARATOR
indexesit                        is a IDENTIFIER/VARIABLE
val                      is a IDENTIFIER/VARIABLE
=                       is a OPERATOR
*                       is a OPERATOR
;                       is a SEPARATOR
it                      is a IDENTIFIER/VARIABLE
}                       is a CLOSE CURLY BRACKET
}                       is a CLOSE CURLY BRACKET
(                       is a OPEN BRACKET
)                       is a CLOSED BRACKET
;                       is a SEPARATOR
s.eraseval                      is a IDENTIFIER/VARIABLE
(                       is a OPEN BRACKET
)                       is a CLOSED BRACKET
;                       is a SEPARATOR
s.insertpagesi                  is a IDENTIFIER/VARIABLE
+                       is a OPERATOR
+                       is a OPERATOR
;                       is a SEPARATOR
pagef                   is a IDENTIFIER/VARIABLE
}                       is a CLOSE CURLY BRACKET
indexespagesi                   is a IDENTIFIER/VARIABLE
=                       is a OPERATOR
;                       is a SEPARATOR
i                       is a IDENTIFIER/VARIABLE
}                       is a CLOSE CURLY BRACKET
}                       is a CLOSE CURLY BRACKET
cout<<"ntPage                   is a IDENTIFIER/VARIABLE
Faults                  is a IDENTIFIER/VARIABLE
"<<pagef<<                      is a STRING
"ntHits                 is a STRING
-                       is a OPERATOR
;                       is a SEPARATOR
"<<npagef<<"n"                  is a STRING
}                       is a CLOSE CURLY BRACKET
void                    is a KEYWORD
(                       is a OPEN BRACKET
)                       is a CLOSED BRACKET
PageReplacement                 is a IDENTIFIER/VARIABLE
{                       is a OPEN CURLY BRACKET
cout<<"nttOS                    is a IDENTIFIER/VARIABLE
Lab                     is a IDENTIFIER/VARIABLE
Assignment                      is a IDENTIFIER/VARIABLE
Page                    is a IDENTIFIER/VARIABLE
Replacement                     is a IDENTIFIER/VARIABLE
;                       is a SEPARATOR
Algorithm"                      is a IDENTIFIER/VARIABLE
cout<<"ntttBy                   is a IDENTIFIER/VARIABLE
Sanskar                 is a IDENTIFIER/VARIABLE
Sharma                  is a IDENTIFIER/VARIABLE
0                       is a NUMBER
9                       is a NUMBER
0                       is a NUMBER
;                       is a SEPARATOR
090"                    is a IDENTIFIER/VARIABLE
cout<<"nttt                     is a IDENTIFIER/VARIABLE
PRN                     is a IDENTIFIER/VARIABLE
```

```
0                        is a NUMBER
1                        is a NUMBER
2                        is a NUMBER
0                        is a NUMBER
1                        is a NUMBER
8                        is a NUMBER
0                        is a NUMBER
3                        is a NUMBER
8                        is a NUMBER
1                        is a NUMBER
;                        is a SEPARATOR
0120180381"                      is a IDENTIFIER/VARIABLE
cout<<"ntChoose                  is a IDENTIFIER/VARIABLE
the                      is a IDENTIFIER/VARIABLE
Page                     is a IDENTIFIER/VARIABLE
Replacement                      is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
algorithm.n"                     is a IDENTIFIER/VARIABLE
1                        is a NUMBER
cout<<"tt1.                      is a IDENTIFIER/VARIABLE
FIFOn"<<                         is a IDENTIFIER/VARIABLE
2                        is a NUMBER
"tt2.                    is a STRING
Optimal                  is a IDENTIFIER/VARIABLE
Page                     is a IDENTIFIER/VARIABLE
Replacement.n"<<                         is a IDENTIFIER/VARIABLE
3                        is a NUMBER
"tt3.                    is a STRING
Least                    is a IDENTIFIER/VARIABLE
Recently                         is a IDENTIFIER/VARIABLE
Usedn"<<                         is a IDENTIFIER/VARIABLE
4                        is a NUMBER
"tt4.                    is a STRING
EXITn"<<                         is a IDENTIFIER/VARIABLE
"ttEnter                         is a STRING
your                     is a IDENTIFIER/VARIABLE
choice                   is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
"                        is a STRING
int                      is a KEYWORD
;                        is a SEPARATOR
choice                   is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
cin>>choice                      is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
{                        is a OPEN CURLY BRACKET
switchchoice                     is a IDENTIFIER/VARIABLE
case                     is a KEYWORD
1                        is a NUMBER
1                        is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
FIFO                     is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
PageReplacement                  is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
break                    is a KEYWORD
case                     is a KEYWORD
2                        is a NUMBER
2                        is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
Optimal                  is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
PageReplacement                  is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
break                    is a KEYWORD
case                     is a KEYWORD
3                        is a NUMBER
3                        is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
Least                    is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
PageReplacement                  is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
break                    is a KEYWORD
case                     is a KEYWORD
4                        is a NUMBER
4                        is a IDENTIFIER/VARIABLE
(                        is a OPEN BRACKET
0                        is a NUMBER
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
exit0                    is a IDENTIFIER/VARIABLE
;                        is a SEPARATOR
break                    is a KEYWORD
default                  is a KEYWORD
(                        is a OPEN BRACKET
-                        is a OPERATOR
1                        is a NUMBER
)                        is a CLOSED BRACKET
;                        is a SEPARATOR
/                        is a OPERATOR
/                        is a OPERATOR
exit1entered                     is a IDENTIFIER/VARIABLE
wrong                    is a IDENTIFIER/VARIABLE
choice                   is a IDENTIFIER/VARIABLE
}                        is a CLOSE CURLY BRACKET
}                        is a CLOSE CURLY BRACKET
```

```
        int                      is a KEYWORD
        (                        is a OPEN BRACKET
        )                        is a CLOSED BRACKET
        {                        is a OPEN CURLY BRACKET
        main                     is a IDENTIFIER/VARIABLE
        (                        is a OPEN BRACKET
        )                        is a CLOSED BRACKET
        ;                        is a SEPARATOR
        system"clear"                    is a IDENTIFIER/VARIABLE
        /                        is a OPERATOR
        /                        is a OPERATOR
        Page                     is a IDENTIFIER/VARIABLE
        Replacement                      is a IDENTIFIER/VARIABLE
        Algorithms.                      is a IDENTIFIER/VARIABLE
        (                        is a OPEN BRACKET
        )                        is a CLOSED BRACKET
        ;                        is a SEPARATOR
        PageReplacement                  is a IDENTIFIER/VARIABLE
        return                   is a KEYWORD
        0                        is a NUMBER
        ;                        is a SEPARATOR
        0                        is a IDENTIFIER/VARIABLE
        }                        is a CLOSE CURLY BRACKET

--------------------------------
Process exited after 0.6963 seconds with return value 0
Press any key to continue . . .

*/
```