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#include<iostream>
#include<string.h>
using namespace std;

#define N strlen(g)

char t[28],cs[28],g[] = "1011";
int a,e,c;

void xor()
{
    for(c = 1;c<N ; c++)
    {
        cs[c] = ((cs[c] == g[c]) ? '0' : '1');
    }
}

void crc()
{
    for(e=0;e<N;e++)
    {
        cs[e]=t[e];
    }

    do
    {
        if(cs[0] == '1')
            xor();
        for(c = 0;c<N-1;c++)
        {
            cs[c] = cs[c+1];
        }
        cs[c] = t[e++];
    }while(e<= a+N-1);

}

int main()
{
    cout<<"\n\tEnter data : ";
    cin>>t;
    cout<<"\n\t-----";
    cout<<"\n\tGenerating polynomial : "<<g;
    a= strlen(t);
    for(e=a;e<a+N-1;e++)
    {
        t[e] = '0';
    }
    cout<<"\n\t-----";
    cout<<"\n\tModified data is : "<<t;
    cout<<"\n\t-----";
}

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crc();
cout<<"\n\tChecksum is : "<<cs;
for(e=a;e<a+N-1;e++)
{
    t[e]=cs[e-a];
}
cout<<"\n\t-----";
cout<<"\n\tFinal codeward is : "<<t;
cout<<"\n\t-----";
cout<<"\n\tTest error detection 0(yes) 1(no) : ";
cin>>e;
if(e==0)
{
    do{
        cout<<"\n\tEnter the position where error is to be inserted : ";
        cin>>e;
    }while(e==0 || e>a+N-1);
    t[e-1] = (t[e-1] == '0') ? '1' : '0';
    cout<<"\n\t-----";
    cout<<"\n\tErroneous data : "<<t<<"\n";
}
}
crc();
for(e=0;(e<N-1) && (cs[e] != '1');e++)
{
    if(e<N-1)
    {
        cout<<"\n\tError Detected \n\n";
    }
    else
    {
        cout<<"\n\tNo Error Detection \n\n";
    }
}
cout<<"\n\t-----\n\n";
return 0;

}

```