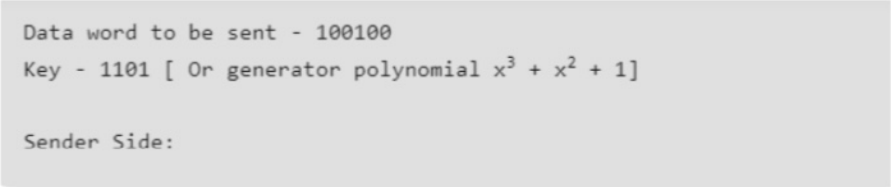
EXPERIMENT 3

OBJECTIVE: CRC PROGRAMMING IN C

CRC or Cyclic Redundancy Check is a method of detecting accidental changes/errors in the communication channel.

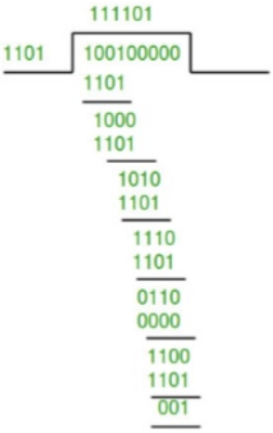
CRC uses Generator Polynomial which is available on both sender and receiver side. An example generator polynomial is of the form like $x^3 + x + 1$. This generator polynomial represents key 1011. Another example is $x^2 + 1$ that represents key 101.

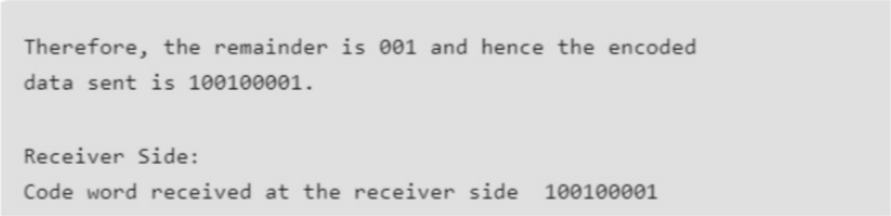


Data word to be sent - 100100

Key - 1101 [Or generator polynomial $x^3 + x^2 + 1$]

Sender Side:





Therefore, the remainder is 001 and hence the encoded data sent is 100100001.

Receiver Side:

Code word received at the receiver side 100100001

```
// Include headers
#include<stdio.h>
#include<string.h>
// length of the generator polynomial
#define N strlen(gen_poly)
// data to be transmitted and received
char data[28];
// CRC value
charcheck_value[28];
// generator polynomial
chargen_poly[10];
// variables
intdata_length,i,j;
```

```
// function that performs XOR operation
void XOR(){
   // if both bits are the same, the output is 0
   // if the bits are different the output is 1
for(j = 1;j < N; j++)
check_value[j] = (( check_value[j] == gen_poly[j])?'0':'1');

}
// Function to check for errors on the receiver side
void receiver(){
// get the received data
printf("Enter the received data: ");
scanf("%s", data);
printf("\n-----------------------------\n");
printf("Data received: %s", data);
// Cyclic Redundancy Check
crc();
// Check if the remainder is zero to find the error
for(i=0;(i<N-1) && (check_value[i]!='1');i++);
if(i<N-1)
printf("\nError detected\n\n");
else
printf("\nNo error detected\n\n");
}

voidcrc(){
   // initializing check_value
for(i=0;i<N;i++)
check_value[i]=data[i];
do{
   // check if the first bit is 1 and calls XOR function
if(check_value[0]=='1')
XOR();
// Move the bits by 1 position for the next computation
for(j=0;j<N-1;j++)
check_value[j]=check_value[j+1];
      // appending a bit from data
check_value[j]=data[i++];
}while(i<=data_length+N-1);
// loop until the data ends
}

int main()
{
   // get the data to be transmitted
printf("\nEnter data to be transmitted: ");
scanf("%s",data);
printf("\n Enter the Generating polynomial: ");
   // get the generator polynomial
scanf("%s",gen_poly);
```

```
   // find the length of data
data_length=strlen(data);
   // appending n-1 zeros to the data
for(i=data_length;i<data_length+N-1;i++)
data[i]='0';
printf("\n----------------------------------------");
// print the data with padded zeros
printf("\n Data padded with n-1 zeros : %s",data);
printf("\n----------------------------------------");
// Cyclic Redundancy Check
crc();
// print the computed check value
printf("\nCRC or Check value is : %s",check_value);
// Append data with check_value(CRC)
for(i=data_length;i<data_length+N-1;i++)
data[i]=check_value[i-data_length];
printf("\n----------------------------------------");
// printing the final data to be sent
printf("\n Final data to be sent : %s",data);
printf("\n----------------------------------------\n");
// Calling the receiver function to check errors
receiver();
return 0;
}
```

OUTPUT:

```
Enter data to be transmitted: 1001101
Enter the Generating polynomial: 1011
----------------------------------------
Data padded with n-1 zeros : 1001101000
----------------------------------------
CRC or Check value is : 101
----------------------------------------
Final data to be sent : 1001101101
----------------------------------------
Enter the received data: 1001101101
-----------------------------
Data received: 1001101101
No error detected
```

As the data transmitted and received are the same, &&there is no error** in the signal.

In the case of error,

```
Enter the received data: 1001001101
-----------------------------
Data received: 1001001101
Error detected
```