LAB ASSIGNMENT – 2

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19BCE2141

Checksum

Code –

```
#include<stdio.h>
#include<conio.h>
#include <cstdlib>
int add(int,int);
int com(int);
void receiver(int data1[],int data2[],int checksum[], int newdata[], int dl);
void modify(int data1[],int data2[],int checksum[], int newdata[], int dl);
void sender()
{
    int i,dl,dil,choice;
    int data1[10],data2[10],newdata[10],checksum[10];
    printf("\n Enter the data length: ");
    scanf("%d",&dl);
    printf("\n Enter the data1: ");
    for(i=0;i<dl;i++)
        scanf("%d",&data1[i]);
    printf("\n Enter the data2: ");
    for(i=0;i<dl;i++)
        scanf("%d",&data2[i]);
```

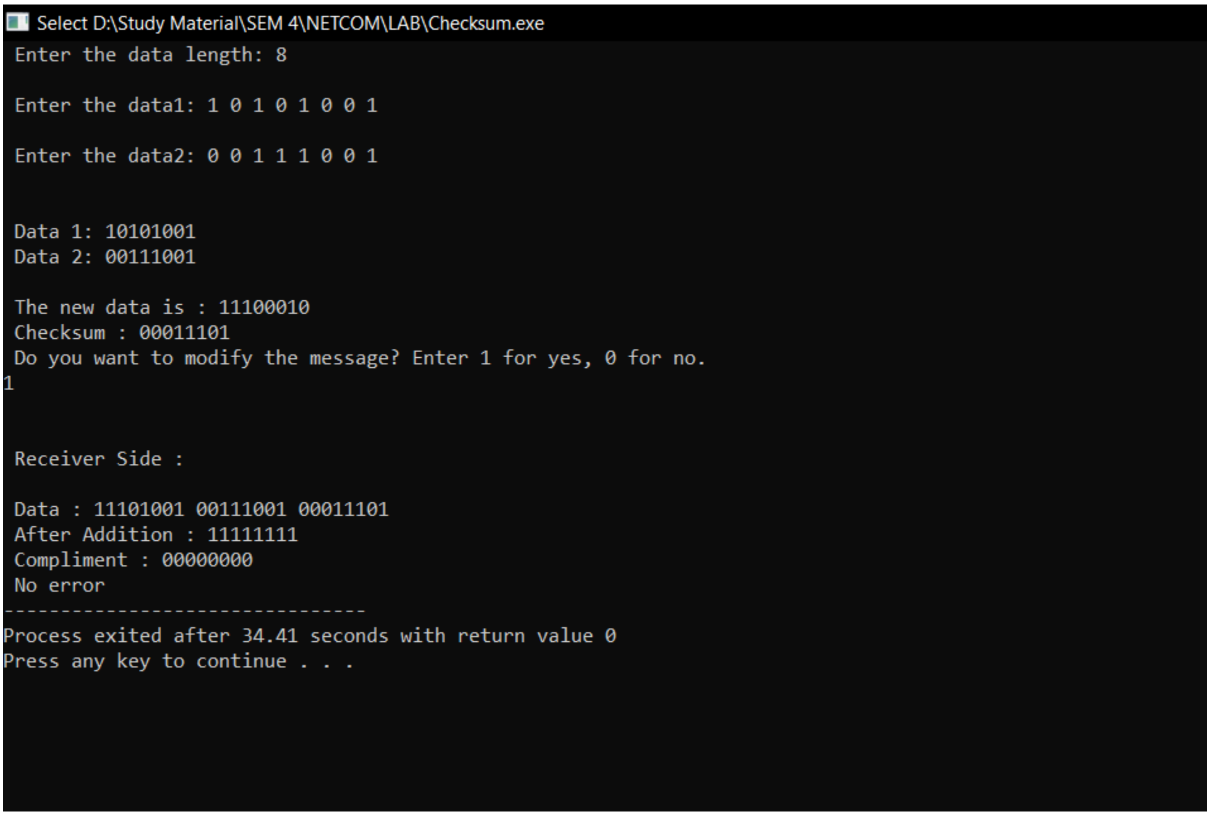
```
  for(i=dl-1;i>=0;i--)
            {
            newdata[i]=add(data1[i],data2[i]);
    }
      printf("\n\n Data 1: ");
      for(i=0;i<dl;i++)
        printf("%d",data1[i]);
      printf("\n Data 2: ");
      for(i=0;i<dl;i++)
    printf("%d",data2[i]);
      printf("\n\n The new data is : ");
      for(i=0;i<dl;i++)
      {
            printf("%d",newdata[i]);
      }
      printf("\n Checksum : ");
      for(i=0;i<dl;i++)
      {
      checksum[i]=com(newdata[i]);
      printf("%d",checksum[i]);
      }
      printf("\n Do you want to modify the message? Enter 1 for yes, 0 for
no.\n");
      scanf("%d",&choice);
      if(choice)
            modify(data1,data2,checksum, newdata, dl);
      else
```

```
                    receiver(data1,data2,checksum, newdata, dl);
}
void receiver(int data1[],int data2[], int checksum[], int newdata[], int dl)
{
          int i,comp[10],sum=0;
          printf("\n\n Receiver Side : \n");
          printf("\n Data : ");
          for(i=0;i<dl;i++)
          printf("%d",data1[i]);printf(" ");
          for(i=0;i<dl;i++)
          printf("%d",data2[i]);printf(" ");
          for(i=0;i<dl;i++)
          printf("%d",checksum[i]);
          printf("\n After Addition : ");
          for(i=dl-1;i>=0;i--)
          {
       newdata[i]=add(newdata[i],checksum[i]);
   }
          for(i=0;i<dl;i++)
          {
                    printf("%d",newdata[i]);
          }
          printf("\n Compliment : ");
          for(i=0;i<dl;i++)
          {
          comp[i]=com(newdata[i]);
          printf("%d",comp[i]);
          }
          for(i=0;i<dl;i++)
          {
          sum=sum+comp[i];
          }
          if(sum==0)
                    printf("\n No error");
          else
                    printf("\n Error");
}
void modify(int data1[], int data2[], int checksum[], int newdata[], int dl)
{
   int rnd = (rand() % dl);
   if (data1[rnd] == 0)
   {
      data1[rnd] = 1;
   }
   else
   {
      data1[rnd] = 0;
   }
   receiver(data1,data2,checksum, newdata, dl);
}
int main()
{
```

```
            sender();
            return 0;
}
int add(int x, int y)
{
static int carry=0;
 if(x==1 && y==1 && carry==0)
 {
 carry=1;
  return 0;
 }
 else if(x==1 && y==1 && carry==1)
 {
 carry=1;
 return 1;
 }
 else if(x==1 && y==0 && carry==0)
  {
  carry=0;
  return 1;
  }
  else if(x==1 && y==0 && carry==1)
  {
  carry=1;
  return 0;
  }
  else if(x==0 && y==1 && carry==0)
 {
 carry=0;
 return 1;
 }
 else if(x==0 && y==1 && carry==1)
 {
 carry=1;
 return 0;
 }
 else if(x==0 && y==0 && carry==0)
 {
 carry=0;
 return 0;
 }
 else
 {
 carry=0;
 return 1;
 }
}
int com(int a)
{
	if(a==0)
		return 1;
	else
```

```
            return 0;
}
```

Output –



Select D:\Study Material\SEM 4\NETCOM\LAB\Checksum.exe

```
 Enter the data length: 8

 Enter the data1: 1 0 1 0 1 0 0 1

 Enter the data2: 0 0 1 1 1 0 0 1


 Data 1: 10101001
 Data 2: 00111001

 The new data is : 11100010
 Checksum : 00011101
 Do you want to modify the message? Enter 1 for yes, 0 for no.
1


 Receiver Side :

 Data : 11101001 00111001 00011101
 After Addition : 11111111
 Compliment : 00000000
 No error
--------------------------------
Process exited after 34.41 seconds with return value 0
Press any key to continue . . .
```

CRC

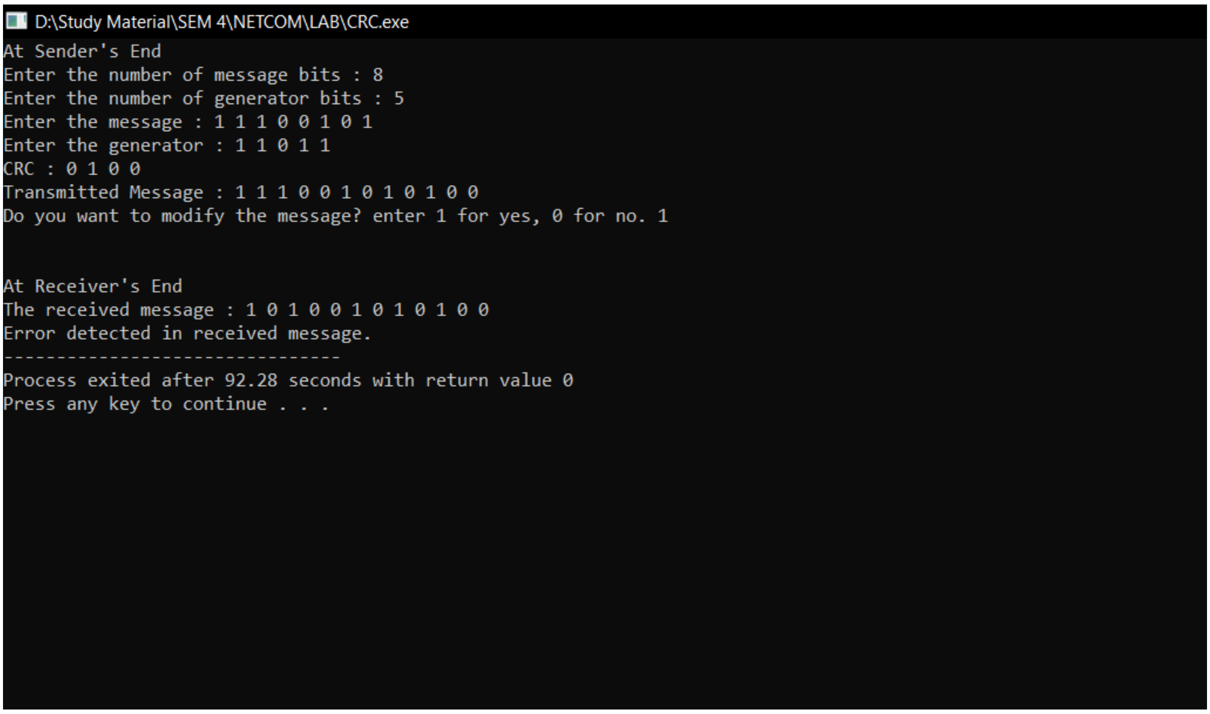
Code –

```
#include <iostream>

#include <cstdlib>

using namespace std;

void division(int temp[], int gen[], int size, int r)

{

   for (int i = 0; i < size; i++)

   {

      if (gen[0] == temp[i])

      {

         for (int j = 0, k = i; j < r + 1; j++, k++)
```

```
                if (!(temp[k] ^ gen[j]))
                    temp[k] = 0;
                else
                    temp[k] = 1;
            }
        }
    }

    void receiver(int message[], int size, int r, int gen[])
    {
        int temp[50];
        cout << endl<< endl<< "At Receiver's End " << endl;
        cout << "The received message : ";
        for (int i = 0; i < size + r; i++)
            cout << message[i] << " ";
        for (int i = 0; i < size + r; i++)
            temp[i] = message[i];
        division(temp, gen, size, r);
        for (int i = 0; i < r; i++)
        {
            if (temp[size + i])
            {
                cout << "\nError detected in received message.";
                return;
            }
        }
        cout << "\nNo error in received Message.\nReceived Message : ";
        for (int i = 0; i < size; i++)
            cout << message[i] << " ";
    }

    int modify(int message[], int size, int r, int gen[])
    {
        int rnd = (rand() % size);
        if (message[rnd] == 0)
        {
            message[rnd] = 1;
        }
        else
        {
            message[rnd] = 0;
        }
        receiver(message, size, r, gen);
    }

    void sender()
    {
        int size, r, message[50], gen[50], temp[50], choice = 0;
        cout << "At Sender's End " << endl;
        cout << "Enter the number of message bits : ";
        cin >> size;
        cout << "Enter the number of generator bits : ";
```

```
cin >> r;
cout << "Enter the message : ";
for (int i = 0; i < size; i++)
   cin >> message[i];
cout << "Enter the generator : ";
for (int i = 0; i < r; i++)
   cin >> gen[i];
r--;
for (int i = 0; i < r; i++)
   message[size + i] = 0;
for (int i = 0; i < size + r; i++)
   temp[i] = message[i];
division(temp, gen, size, r);
cout << "CRC : ";
for (int i = 0; i < r; i++)
{
   cout << temp[size + i] << " ";
   message[size + i] = temp[size + i];
}
cout <<endl<< "Transmitted Message : ";
for (int i = 0; i < size + r; i++)
   cout << message[i] << " ";
cout << "\nDo you want to modify the message? enter 1 for yes, 0 for no. ";
cin >> choice;
if (choice)
{
        modify(message, size, r, gen);
    }
    else
    {
        receiver(message, size, r, gen);
    }
}

int main()
{
    sender();
    return 0;
}
```

Output –



D:\Study Material\SEM 4\NETCOM\LAB\CRC.exe

```
At Sender's End
Enter the number of message bits : 8
Enter the number of generator bits : 5
Enter the message : 1 1 1 0 0 1 0 1
Enter the generator : 1 1 0 1 1
CRC : 0 1 0 0
Transmitted Message : 1 1 1 0 0 1 0 1 0 1 0 0
Do you want to modify the message? enter 1 for yes, 0 for no. 1


At Receiver's End
The received message : 1 0 1 0 0 1 0 1 0 1 0 0
Error detected in received message.
--------------------------------
Process exited after 92.28 seconds with return value 0
Press any key to continue . . .
```

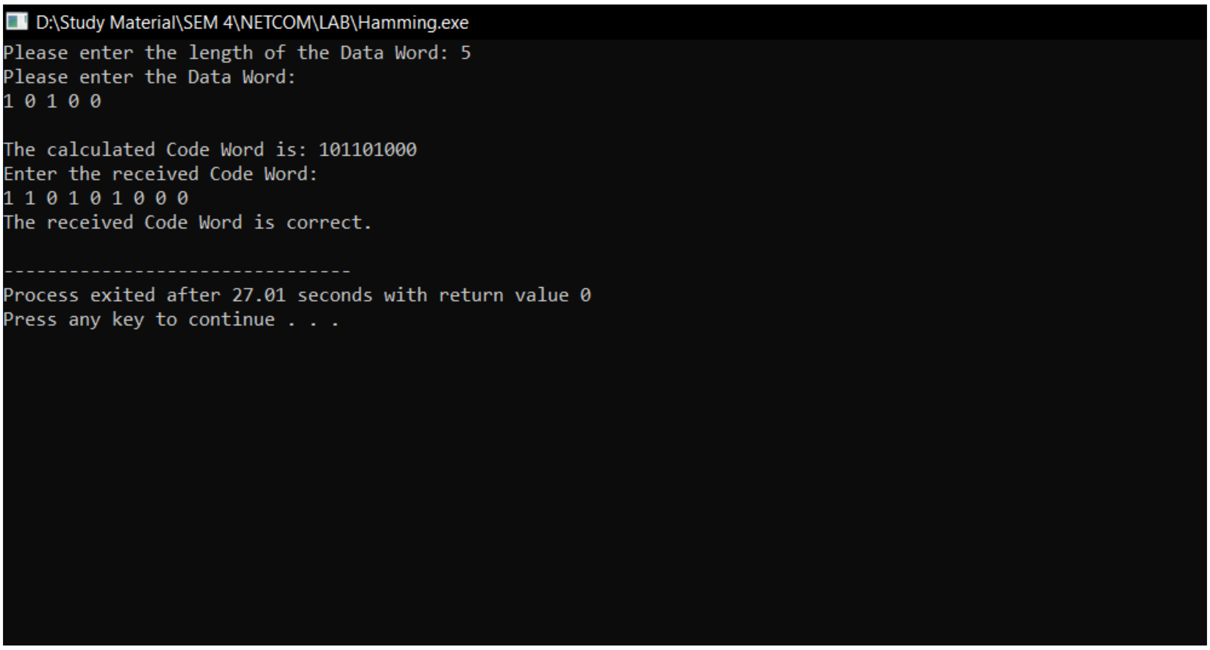
Hamming Code

Code –

```
#include <stdio.h>
#include <math.h>
int input[32];
int code[32];
int ham_calc(int,int);
void Receiver(int,int);
void sender()
{
    int n,i,p_n = 0,c_l,j,k;
    printf("Please enter the length of the Data Word: ");
    scanf("%d",&n);
    printf("Please enter the Data Word:\n");
    for(i=0;i<n;i++)
    {
        scanf("%d",&input[i]);
    }

    i=0;
    while(n>(int)pow(2,i)-(i+1))
    {
        p_n++;
        i++;
    }
    c_l = p_n + n;

    j=k=0;
    for(i=0;i<c_l;i++)
    {

        if(i==((int)pow(2,k)-1))
        {
            code[i]=0;
            k++;
        }
        else
        {
            code[i]=input[j];
            j++;
        }
    }
    for(i=0;i<p_n;i++)
    {
        int position = (int)pow(2,i);
        int value = ham_calc(position,c_l);
        code[position-1]=value;
    }
    printf("\nThe calculated Code Word is: ");
    for(i=0;i<c_l;i++)
        printf("%d",code[i]);
        printf("\n");

        Receiver( c_l,  p_n);

}

void Receiver(int c_l, int p_n)

        {

           int i;

   printf("Enter the received Code Word:\n");

        for(i=0;i<c_l;i++)

                scanf("%d",&code[i]);



        int error_pos = 0;

        for(i=0;i<p_n;i++)

        {

                int p = (int)pow(2,i);

                int value = ham_calc(p,c_l);

                if(value != 0)

                        error_pos+=p;

        }

        if(error_pos == 1)

                printf("The received Code Word is correct.\n");

        else

                printf("Error at bit position: %d\n",error_pos);

}

int ham_calc(int p,int c_l)

{

        int count=0,i,j;
```

```
    i=p-1;
    while(i<c_l)
    {
        for(j=i;j<i+p;j++)
        {
            if(code[j] == 1)
                count++;
        }
        i=i+2*p;
    }
    if(count%2 == 0)
        return 0;
    else
        return 1;
}
int main()
{
sender();
return 0;
}
```

Output –



D:\Study Material\SEM 4\NETCOM\LAB\Hamming.exe

```
Please enter the length of the Data Word: 5
Please enter the Data Word:
1 0 1 0 0

The calculated Code Word is: 101101000
Enter the received Code Word:
1 1 0 1 0 1 0 0 0
The received Code Word is correct.

--------------------------------
Process exited after 27.01 seconds with return value 0
Press any key to continue . . .
```