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NETWORK AND COMMUNICATIONS LAB (CSE-1004)

DIGITAL ASSIGNMENT-01

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Question – 1:

Write a program to check the error in receiver using parity bit.

Code:

```
#include<stdio.h>
void main()
{
    int n;
    printf("\nEnter a 4-bit number...");
    scanf("%d",&n);
    int dup=n;
    int count=0;
    while(dup!=0)
    {
        int d=dup%10;
        if(d==1)
            count++;
        dup=dup/10;
    }
    int par1;
    if(count%2==0)
    {
        printf("\nEven parity");
        par1=0;
        n=n*10+par1;
    }
    else
    {
        printf("\nOdd parity");
        par1=1;
        n=n*10+par1;
    }
    printf("\n\nEnter another 5-bit number...");
    int n2;
    scanf("%d",&n2);
    dup=n2/10;
    int par2;
    count=0;
    while(dup!=0)
```

```

{
    int d=dup%10;
    if(d==1)
        count++;
    dup=dup/10;
}
if(count%2==0)
{
    par2=0;
}
else
{
    par2=1;
}
if(par1==par2)
    printf("Parity bits matched. No error in code..");
else
    printf("Error in code. Not matched...");
}

```

DEV C++ 5.11
C:\Users\Shaunak_Sensarma\Desktop\Programming\Network\parity.c - Dev-C++ 5.11

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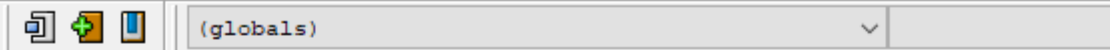
(globals)

parity.c

```

1  #include<stdio.h>
2  void main()
3  {
4      int n;
5      printf("\nEnter a 4-bit number...");
6      scanf("%d",&n);
7      int dup=n;
8      int count=0;
9      while(dup!=0)
10     {
11         int d=dup%10;
12         if(d==1)
13             count++;
14         dup=dup/10;
15     }
16     int par1;
17     if(count%2==0)
18     {
19         printf("\nEven parity");
20         par1=0;
21         n=n*10+par1;
22     }
23     else
24     {
25         printf("\nOdd parity");
26         par1=1;
27         n=n*10+par1;
28     }

```



parity.c

```
18 {
19     printf("\nEven parity");
20     par1=0;
21     n=n*10+par1;
22 }
23 else
24 {
25     printf("\nOdd parity");
26     par1=1;
27     n=n*10+par1;
28 }
29 printf("\n\nEnter another 5-bit number...");
30 int n2;
31 scanf("%d",&n2);
32 dup=n2/10;
33 int par2;
34 count=0;
35 while(dup!=0)
36 {
37     int d=dup%10;
38     if(d==1)
39         count++;
40     dup=dup/10;
41 }
42 if(count%2==0)
43 {
44     par2=0;
45 }
46 else
47 {
48     par2=1;
49 }
50 if(par1==par2)
51     printf("Parity bits matched. No error in code..");
52 else
53     printf("Error in code. Not matched...");
54 }
55
```

Line: 15

Col: 6

Sel: 0

Lines: 55

Length: 963

Insert

Output:

```
C:\Users\Shaunak_Sensarma\Desktop\Programming\Network\parity.exe

Enter a 4-bit number...1011

Odd parity

Enter another 5-bit number...10101
Error in code. Not matched...
-----
Process exited after 5.849 seconds with return value 29
Press any key to continue . . .
```

```
C:\Users\Shaunak_Sensarma\Desktop\Programming\Network\parity.exe

Enter a 4-bit number...1001

Even parity

Enter another 5-bit number...10010
Parity bits matched. No error in code..
-----
Process exited after 11.99 seconds with return value 39
Press any key to continue . . .
```

```
C:\Users\Shaunak_Sensarma\Desktop\Programming\Network\parity.exe

Enter a 4-bit number...1010

Even parity

Enter another 5-bit number...10101
Parity bits matched. No error in code..
-----
Process exited after 5.865 seconds with return value 39
Press any key to continue . . .
```

Question – 2:

Write a program to check a one-bit error using CRC

Code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int i,f[20],n[50];
    int div[50];
    int j,temp,quotient[20];
    int z[10];
    printf("\nEnter the 8-bit number....\n");
    for(i=0;i<8;i++)
    {
        scanf("%d",&n[i]);
    }
    printf("\nEnter the divisor of length 4...\n");
    for(i=0;i<4;i++)
    {
        scanf("%d",&div[i]);
    }
    for(i=8;i<12;i++)
    {
        n[i]=0;
    }
    for(i=0;i<8;i++)
    {
        temp=i;
        if(n[i]==1)
        {
            for(j=0;j<4;j++)
            {
                if(n[temp]==div[j])
                {
                    n[temp]=0;
                    f[j]=0;
                }
                else
                {
                    n[temp]=1;
                    f[j]=1;
                }
                temp++;
            }
            quotient[i]=1;
        }
        else
        {
            quotient[i]=0;
        }
    }
}
```

```

printf("\n The quotient is...\n");
for(i=0;i<8;i++)
{
    printf("%d",quotient[i]);
}
printf("\n The remainder is...\n");
for(j=0;j<4;j++)
{
    printf("%d",f[j]);
}
}

```

C:\Users\Shaunak_Sensarma\Desktop\Programming\Network\crc.c - [Executing] - Dev-C++ 5.11

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(globals)

parity.c crc.c

```

1  #include<stdio.h>
2  #include<conio.h>
3  void main()
4  {
5      int i,f[20],n[50];
6      int div[50];
7      int j,temp,quotient[20];
8      int z[10];
9      printf("\nEnter the 8-bit number...\n");
10     for(i=0;i<8;i++)
11     {
12         scanf("%d",&n[i]);
13     }
14     printf("\nEnter the divisor of length 4...\n");
15     for(i=0;i<4;i++)
16     {
17         scanf("%d",&div[i]);
18     }
19     for(i=8;i<12;i++)
20     {
21         n[i]=0;
22     }
23     for(i=0;i<8;i++)
24     {
25         temp=i;
26         if(n[i]==1)
27         {
28             for(j=0;j<4;j++)
29             {
30                 if(n[temp]==div[j])
31                 {
32                     n[temp]=0;
33                     f[j]=0;
34                 }
35                 else
36                 {
37                     n[temp]=1;
38                     f[j]=1;
39                 }
40             }
41         }
42     }
43 }

```

Line: 53 Col: 6 Sel: 0 Lines: 59 Length: 837 Insert

```
31 {
32     {
33         n[temp]=0;
34         f[j]=0;
35     }
36     else
37     {
38         n[temp]=1;
39         f[j]=1;
40     }
41     temp++;
42     quotient[i]=1;
43 }
44 else
45 {
46     quotient[i]=0;
47 }
48 }
49 printf("\n The quotient is...\n");
50 for(i=0;i<8;i++)
51 {
52     printf("%d",quotient[i]);
53 }
54 printf("\n The remainder is...\n");
55 for(j=0;j<4;j++)
56 {
57     printf("%d",f[j]);
58 }
59 }
```

Line: 18 Col: 6 Sel: 0 Lines: 59 Length: 837 Insert

Output:

```
C:\Users\Shaunak_Sensarma\Desktop\Programming\Network\crc.exe
Enter the 8-bit number....
1
0
1
0
1
0
1
0
Enter the divisor of length 4...
1
0
0
1
The quotient is...
10111101
The remainder is...
0101
-----
Process exited after 5.299 seconds with return value 1
Press any key to continue . . .
```

```
C:\Users\Shaunak_Sensarma\Desktop\Programming\Network\crc.exe

Enter the 8-bit number....
1
0
1
0
1
0
1
0
0

Enter the divisor of length 4...
1
1
0
1

The quotient is...
11011110
The remainder is...
0011
-----
Process exited after 53.86 seconds with return value 1
Press any key to continue . . .
```

```
C:\Users\Shaunak_Sensarma\Desktop\Programming\Network\crc.exe

Enter the 8-bit number....
1
0
1
1
1
0
1
1

Enter the divisor of length 4...
1
0
1
1

The quotient is...
10001000
The remainder is...
0000
-----
Process exited after 9.652 seconds with return value 1
Press any key to continue . . .
```


Question – 3:

Write a program to detect and correct the error by using Hamming Code

Code:

```
#include<stdio.h>
void main()
{
    int data[10];
    int d[10],c,c1,c2,c3,i;

    printf("\nEnter 4 bits of data \n");
    scanf("%d",&data[0]);
    scanf("%d",&data[1]);
    scanf("%d",&data[2]);
    scanf("%d",&data[4]);
    data[6]=data[0]^data[2]^data[4];
    data[5]=data[0]^data[1]^data[4];
    data[3]=data[0]^data[1]^data[2];
    printf("\nEncoded data is\n");
    for(i=0;i<7;i++)
        printf("%d",data[i]);
    printf("\n\nEnter received data bits\n");
    for(i=0;i<7;i++)
        scanf("%d",&d[i]);
    c1=d[6]^d[4]^d[2]^d[0];
    c2=d[5]^d[4]^d[1]^d[0];
    c3=d[3]^d[2]^d[1]^d[0];
    c=c3*4+c2*2+c1 ;
    if(c==0)
    {
        printf("\nNo error while transmission of data\n");
    }
    else
    {
        printf("\nError on position %d",c);

        printf("\nData sent : ");
        for(i=0;i<7;i++)
            printf("%d",data[i]);

        printf("\nData received : ");
        for(i=0;i<7;i++)
            printf("%d",d[i]);

        printf("\nCorrect message is\n");

        if(d[7-c]==0)
            d[7-c]=1;

        else
            d[7-c]=0;
```

```

        for (i=0;i<7;i++)
        {
            printf("%d",d[i]);
        }
    }
}

```

C:\Users\Shaunak_Sensarma\Desktop\Programming\Network\hamming.c - [Executing] - Dev-C++ 5.11

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(globals)

parity.c crc.c hamming.c

```

1  #include<stdio.h>
2
3  void main()
4  {
5      int data[10];
6      int d[10],c,c1,c2,c3,i;
7
8      printf("\nEnter 4 bits of data \n");
9      scanf("%d",&data[0]);
10     scanf("%d",&data[1]);
11     scanf("%d",&data[2]);
12     scanf("%d",&data[4]);
13     data[6]=data[0]^data[2]^data[4];
14     data[5]=data[0]^data[1]^data[4];
15     data[3]=data[0]^data[1]^data[2];
16     printf("\nEncoded data is\n");
17     for(i=0;i<7;i++)
18     {
19         printf("%d",data[i]);
20     }
21     printf("\n\nEnter received data bits\n");
22     for(i=0;i<7;i++)
23     {
24         scanf("%d",&d[i]);
25         c1=d[6]^d[4]^d[2]^d[0];
26         c2=d[5]^d[4]^d[1]^d[0];
27         c3=d[3]^d[2]^d[1]^d[0];
28         c=c3*4+c2*2+c1 ;
29         if(c==0)
30         {
31             printf("\nNo error while transmission of data\n");
32         }
33         else
34         {
35             printf("\nError on position %d",c);
36
37             printf("\nData sent : ");
38             for(i=0;i<7;i++)
39             {
40                 printf("%d",data[i]);
41             }
42
43             printf("\nData received : ");
44             for(i=0;i<7;i++)
45             {
46                 printf("%d",d[i]);
47             }
48         }
49     }
50 }

```

Line: 52 Col: 24 Sel: 0 Lines: 55 Length: 1124 Insert Don

```
37
38     printf("\nData received : ");
39     for(i=0;i<7;i++)
40         printf("%d",d[i]);
41
42     printf("\nCorrect message is\n");
43
44     if(d[7-c]==0)
45         d[7-c]=1;
46
47     else
48         d[7-c]=0;
49
50     for (i=0;i<7;i++)
51     {
52         printf("%d",d[i]);
53     }
54 }
55 }
```

Line: 23 Col: 28 Sel: 0 Lines: 55 Length: 1124 Insert

Output:

```
C:\Users\Shaunak_Sensarma\Desktop\Programming\Network\hamming.exe

Enter 4 bits of data
1
1
0
1

Encoded data is
1100110

Enter received data bits
1
1
0
0
0
1
0

Error on position 3
Data sent : 1100110
Data received : 1100010
Correct message is
1100110
-----
Process exited after 13.36 seconds with return value 1
Press any key to continue . . .
```

C:\Users\Shaunak_Sensarma\Desktop\Programming\Network\hamming.exe

Enter 4 bits of data

1
0
1
0

Encoded data is

1010010

Enter received data bits

1
0
1
0
0
1
0

No error while transmission of data

Process exited after 30.48 seconds with return value 0

Press any key to continue . . .

C:\Users\Shaunak_Sensarma\Desktop\Programming\Network\hamming.exe

Enter 4 bits of data

1
0
1
1

Encoded data is

1010101

Enter received data bits

1
1
1
0
1
0
1

Error on position 6

Data sent : 1010101

Data received : 1110101

Correct message is

1010101

Process exited after 14.13 seconds with return value 1

Press any key to continue . . .