

# MODERN OPERATING SYSTEM AND COMPUTER NETWORK

## ASSIGNMENT -3

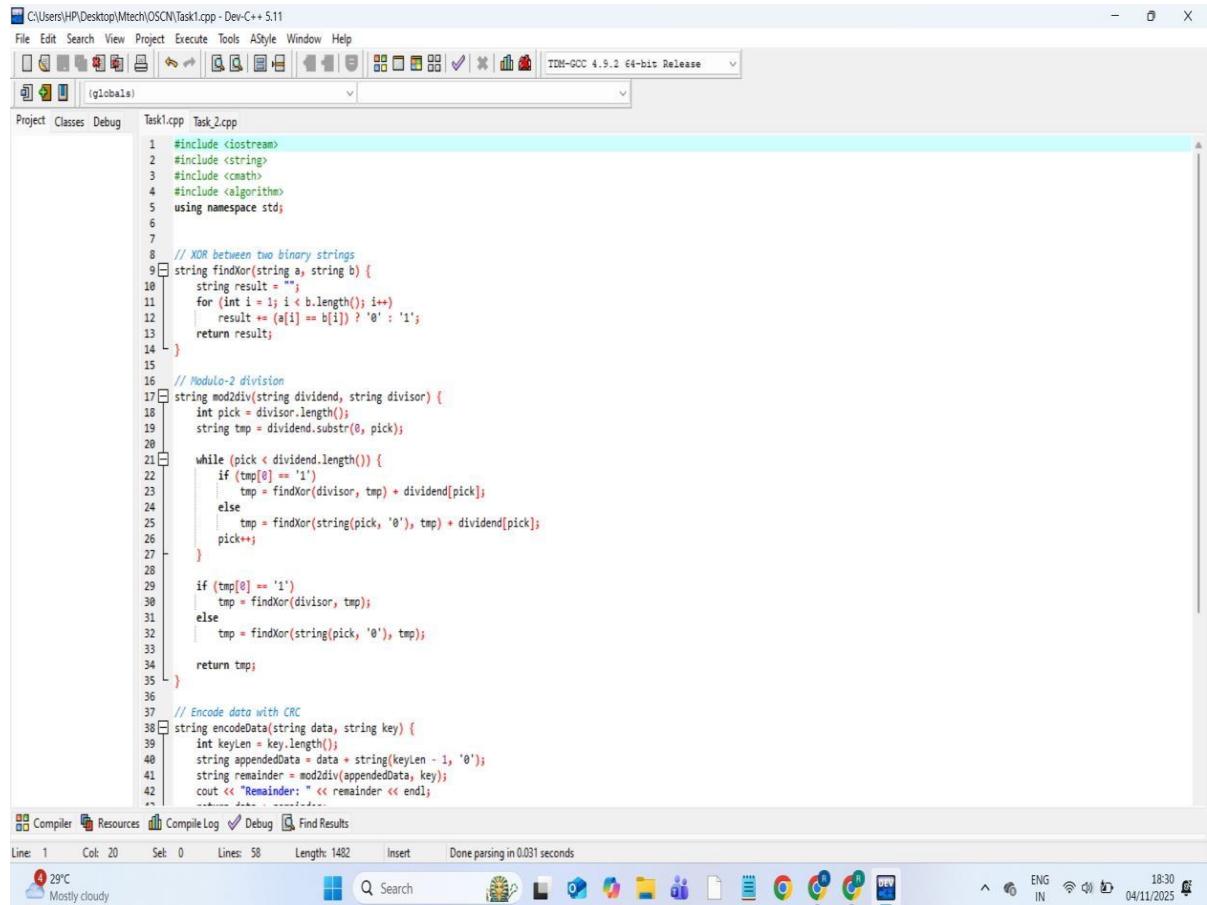
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### Task:1

#### Problem-01:

A bit stream 1101011011 is transmitted using the standard CRC method. The generator polynomial is  $x^4 + x + 1$ . What is the actual bit string transmitted?

#### CODE AND COMPILE RESULTS:



The screenshot shows the Dev-C++ IDE interface with the code for Task1.cpp. The code implements functions for XORing two strings, performing Modulo-2 division, and encoding data with a CRC. The code uses standard C++ libraries like `<iostream>`, `<string>`, `<cmath>`, and `<algorithm>`.

```
1 //include <iostream>
2 //include <string>
3 //include <cmath>
4 #include <algorithm>
5 using namespace std;
6
7
8 // XOR between two binary strings
9 string findXor(string a, string b) {
10    string result = "";
11    for (int i = 0; i < b.length(); i++) {
12        result += (a[i] == b[i]) ? '0' : '1';
13    }
14    return result;
15}
16
17 // Modulo-2 division
18 string mod2div(string dividend, string divisor) {
19    int pick = divisor.length();
20    string tmp = dividend.substr(0, pick);
21
22    while (pick < dividend.length()) {
23        if (tmp[0] == '1')
24            tmp = findXor(divisor, tmp) + dividend[pick];
25        else
26            tmp = findXor(string(pick, '0'), tmp) + dividend[pick];
27        pick++;
28    }
29
30    if (tmp[0] == '1')
31        tmp = findXor(divisor, tmp);
32    else
33        tmp = findXor(string(pick, '0'), tmp);
34
35    return tmp;
36}
37
38 // Encode data with CRC
39 string encodeData(string data, string key) {
40    int keylen = key.length();
41    string appendedData = data + string(keylen - 1, '0');
42    string remainder = mod2div(appendedData, key);
43    cout << "Remainder: " << remainder << endl;
44}
```

The status bar at the bottom shows the following information: Line: 1 Col: 20 Sel: 0 Lines: 58 Length: 1482 Insert Done parsing in 0.031 seconds. The system tray shows the date and time as 04/11/2025 18:30.

```

C:\Users\HP\Desktop\Mtech\OSCN\Task1.cpp - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.3 64-bit Release
(globals) Project Classes Debug Task1.cpp Task_2.cpp
27     }
28
29     if (tmp[0] == '1')
30         tmp = findKor(divisor, tmp);
31     else
32         tmp = findKor(string(pick, '0'), tmp);
33
34     return tmp;
35 }
36
37 // Encode data with CRC
38 string encodeData(string data, string key) {
39     int keylen = key.length();
40     string appendedData = data + string(keylen - 1, '0');
41     string remainder = mod2div(appendedData, key);
42     cout << "Remainder: " << remainder << endl;
43     return data + remainder;
44 }
45
46 int main() {
47     string data = "1101011011";
48     string key = "10011"; // x^4 + x + 1
49
50     cout << "___ TASK 1 ___" << endl;
51     cout << "Data: " << data << endl;
52     cout << "Key: " << key << endl;
53
54     string codeword = encodeData(data, key);
55     cout << "Transmitted Codeword: " << codeword << endl;
56
57     return 0;
58 }

```

Compiler Resources Compile Log Debug Find Results Close

Compilation results...

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- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\HP\Desktop\Mtech\OSCN\Task1.exe
- Output Size: 1.83922386169434 MiB
- Compilation Time: 0.77s

Line: 57 Col: 14 Sel: 0 Lines: 58 Length: 1482 Insert Done parsing in 0.031 seconds

29°C Mostly cloudy

Search

18:30 04/11/2025

## OUTPUT:

```

C:\Users\HP\Desktop\Mtech\  X  +
===== TASK 1 =====
Data: 1101011011
Key: 10011
Remainder: 1110
Transmitted Codeword: 11010110111110

-----
Process exited after 0.2776 seconds with return value 0
Press any key to continue . .

```

## Task:2

### Problem-02:

A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is  $x^3+1$ . 1. What is the actual bit string transmitted? 2. Suppose the third bit from the left is inverted during transmission. How will receiver detect this error?

### CODE AND COMPILED RESULTS:

C:\Users\HP\Desktop\Mtech\OSCN\Task\_2.cpp - [Executing] - Dev-C++ 5.11

File Edit Search View Project Execute Tools AStyle Window Help

Project Classes Debug Task1.cpp Task\_2.cpp

```
1 #include <iostream>
2 #include <string>
3 #include <cmath>
4 #include <algorithm>
5 using namespace std;
6
7
8 // XOR between two binary strings
9 string findXor(string a, string b) {
10    string result = "";
11    for(int i = 0; i < b.length(); i++) {
12        result += (a[i] == b[i]) ? '0' : '1';
13    }
14    return result;
15}
16
17 // Modulo-2 division
18 string mod2div(string dividend, string divisor) {
19    int pick = divisor.length();
20    string tmp = dividend.substr(0, pick);
21
22    while (pick < dividend.length()) {
23        if (tmp[0] == '1')
24            tmp = findXor(divisor, tmp) + dividend[pick];
25        else
26            tmp = findXor(string(pick, '0'), tmp) + dividend[pick];
27        pick++;
28
29        if (tmp[0] == '1')
30            tmp = findXor(divisor, tmp);
31        else
32            tmp = findXor(string(pick, '0'), tmp);
33
34    }
35    return tmp;
36}
37
38 // Encode data with CRC
39 string encodeData(string data, string key) {
40    int keyLen = key.length();
41    string appendedData = data + string(keyLen - 1, '0');
42    string remainder = mod2div(appendedData, key);
43    cout << "Remainder: " << remainder << endl;
44}
```

Compiler Resources Compile Log Debug Find Results

Line: 1 Col: 20 Sel: 0 Lines: 75 Length: 1998 Insert Done parsing in 0.031 seconds

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C:\Users\HP\Desktop\Mtech\OSCN\Task\_2.cpp - Dev-C++ 5.11

File Edit Search View Project Execute Tools AStyle Window Help

Project Classes Debug Task1.cpp Task\_2.cpp

```
44 L }
45
46 // Receiver check
47 bool receiverCheck(string codeword, string key) {
48    string remainder = mod2div(codeword, key);
49    return (remainder.find('1') == string::npos);
50}
51
52 int main() {
53    string data = "10011101";
54    string key = "1001"; // x^3 + 1
55
56    cout << "--- TASK 2 ---" << endl;
57    cout << "Data: " << data << endl;
58    cout << "Key: " << key << endl;
59
60    string codeword = encodeData(data, key);
61    cout << "Transmitted Codeword: " << codeword << endl;
62
63    // Introduce error at 3rd bit
64    string received = codeword;
65    received[2] = (received[2] == '0') ? '1' : '0';
66    cout << "Received (error at bit 3): " << received << endl;
67
68    if (receiverCheck(received, key))
69        cout << "Receiver: No Error Detected" << endl;
70    else
71        cout << "Receiver: Error Detected" << endl;
72
73    return 0;
74}
```

Compiler Resources Compile Log Debug Close

Compilation results...
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- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\HP\Desktop\Mtech\OSCN\Task\_2.exe
- Output Size: 1.83975028991699 MiB
- Compilation Time: 0.78s

Line: 1 Col: 20 Sel: 0 Lines: 75 Length: 1998 Insert Done parsing in 0.031 seconds

29°C Mostly cloudy Search ENG IN 18:43 04/11/2025

## OUTPUT:

```
 C:\Users\HP\Desktop\Mtech\ | + - X  
== TASK 2 ==  
Data: 10011101  
Key: 1001  
Remainder: 100  
Transmitted Codeword: 10011101100  
Received (error at bit 3): 10111101100  
Receiver: Error Detected  
  
-----  
Process exited after 0.2642 seconds with return value 0  
Press any key to continue . . .
```