

MODERN OPERATING SYSTEM AND COMPUTER NETWORK

ASSIGNMENT -3

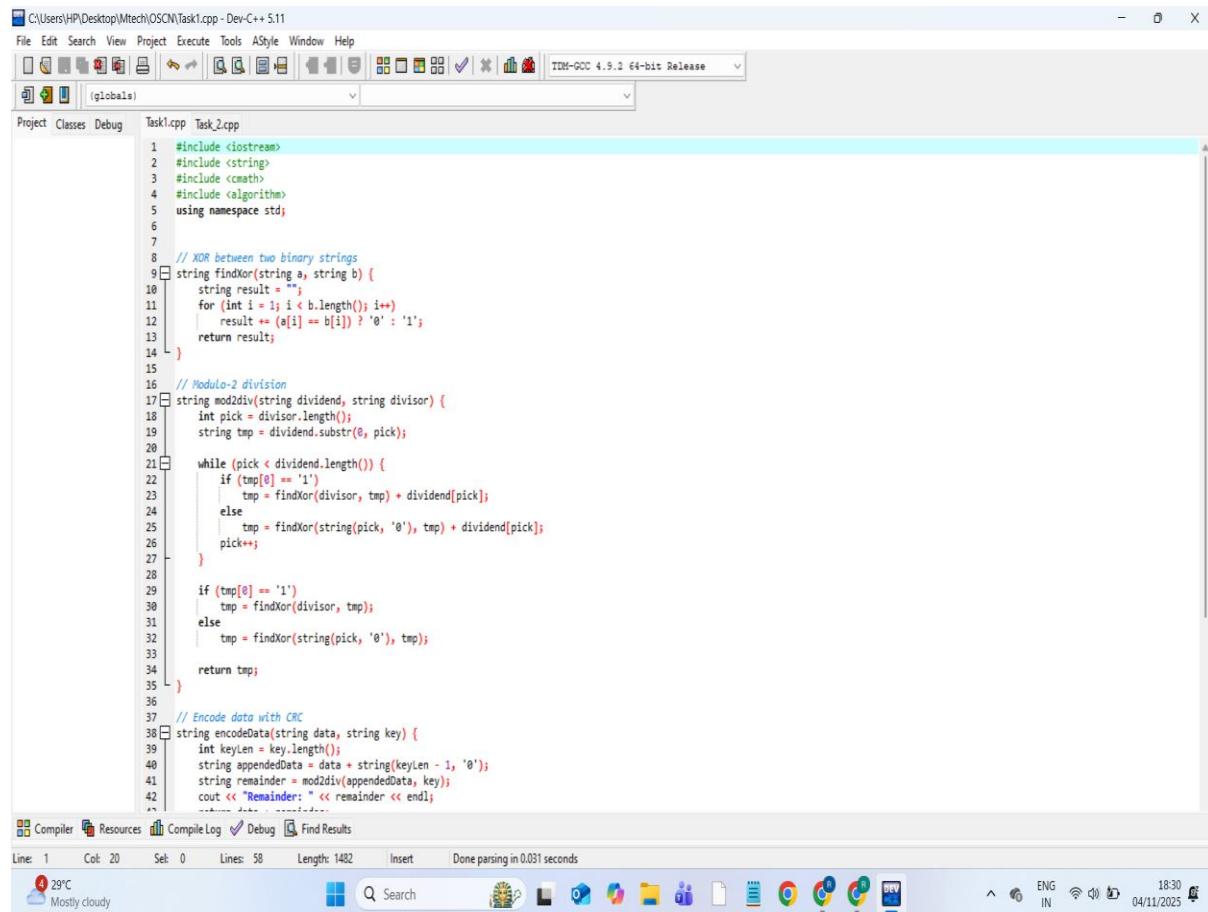
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Task:1

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 following details:

- Title Bar:** C:\Users\HP\Desktop\Mtech\OSCN\Task1.cpp - Dev-C++ 5.11
- Toolbar:** Standard Dev-C++ toolbar with icons for file operations, project management, and compilation.
- MenuBar:** File, Edit, Search, View, Project, Execute, Tools, AStyle, Window, Help.
- ToolBox:** Standard Dev-C++ tool box.
- Project Explorer:** Shows files Task1.cpp and Task2.cpp.
- Code Editor:** Displays the C++ code for Task 1, which includes functions for finding XOR between two strings, performing Modulo-2 division, and encoding data with CRC.

```
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 // Modulo-2 division
17 string mod2div(string dividend, string divisor) {
18    int pick = divisor.length();
19    string tmp = dividend.substr(0, pick);
20
21    while (pick < dividend.length()) {
22        if (tmp[0] == '1')
23            tmp = findXor(divisor, tmp) + dividend[pick];
24        else
25            tmp = findXor(string(pick, '0'), tmp) + dividend[pick];
26        pick++;
27    }
28
29    if (tmp[0] == '1')
30        tmp = findXor(divisor, tmp);
31    else
32        tmp = findXor(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}
```

- Compiler Tab:** Shows the compiler log with the message "Done parsing in 0.031 seconds".
- System Status Bar:** Shows system information like temperature (29°C), weather (Mostly cloudy), and system date/time (04/11/2025, 18:30).

The screenshot shows the Dev-C++ IDE interface. The code editor displays Task1.cpp with the following content:

```

27     }
28     if (tmp[0] == '1')
29         tmp = findXor(divisor, tmp);
30     else
31         tmp = findXor(string(pick, '0'), tmp);
32     return tmp;
33 }
34
35 // Encode data with CRC
36 string encodeData(string data, string key) {
37     int keylen = key.length();
38     string appendedData = data + string(keylen - 1, '0');
39     string remainder = mod2div(appendedData, key);
40     cout << "Remainder: " << remainder << endl;
41     return data + remainder;
42 }
43
44 int main() {
45     string data = "1101011011";
46     string key = "10011"; // x^4 + x + 1
47
48     cout << "---- TASK 1 ----" << endl;
49     cout << "Data: " << data << endl;
50     cout << "Key: " << key << endl;
51
52     string codeword = encodeData(data, key);
53     cout << "Transmitted Codeword: " << codeword << endl;
54
55     return 0;
56 }
57
58 }

```

The compiler log shows the following compilation results:

```

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

```

The status bar at the bottom indicates Line: 57, Col: 14, Sel: 0, Lines: 58, Length: 1482, Insert, Done parsing in 0.031 seconds.

OUTPUT:

The terminal window displays the following output:

```

C:\Users\HP\Desktop\Mtech\> Task1
==== 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 COMPILATION 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

TIM-GCC 4.9.2 64-bit Release

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
36    // Encode data with CRC
37    string encodeData(string data, string key) {
38        int keyLen = key.length();
39        string appendedData = data + string(keyLen - 1, '0');
40        string remainder = mod2div(appendedData, key);
41        cout << "Remainder: " << remainder << endl;
42    }
43
44 }
```

Compiler Resources Compile Log Find Results

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

29°C Mostly cloudy

Search

ENG IN 04/11/2025 18:42

C:\Users\HP\Desktop\Mtech\OSCN\Task_2.cpp - Dev-C++ 5.11

File Edit Search View Project Execute Tools AStyle Window Help

TIM-GCC 4.9.2 64-bit Release

Project Classes Debug Task1.cpp Task_2.cpp

```

44 }
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 Find Results Close

Compilation results...

Abort Compilation

Shorten compiler paths

- 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 04/11/2025 18:43

OUTPUT:

```
 C:\Users\HP\Desktop\Mtech\ X + v - 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 . . .
```