Swinburne University of Technology

School of Science, Computing and Engineering Technologies

ASSIGNMENT COVER SHEET

Subject Code:	COS30008
Subject Title:	Data Structures and Patterns
Assignment number and title:	3, Design Patterns and 12 Bit I/O
Due date:	Wednesday, 30th October 2024, 23:59
Lecturer:	Ms. Siti Hawa

Your name: **Amani Kamaruddin bin Mikhail Raj** **Your student ID:** J21035623

Marker's comments:

Problem	Marks	Obtained
1	138	
Total	138	

Extension certification:

This assignment has been given an extension and is now due on ____________

Signature of Convener: [illegible]

Problem Set 3

Problem Set 3 - 12-bit I/O

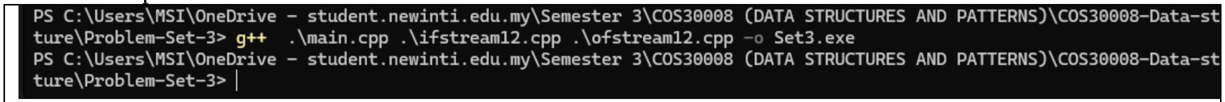
ifstream12.cpp

```cpp
#include "ifstream12.h"
#include <cassert>
#include <iostream>

using namespace std;

ifstream12::ifstream12(const char *aFileName, size_t aBufferSize) : fBuffer(new
byte[aBufferSize]), fBufferSize(aBufferSize),
                                                                    fByteCount(
0), fByteIndex(0), fBitIndex(-1)
{
    if (aFileName)
    {
        open(aFileName);
    }
}

ifstream12::~ifstream12()
{
    close(); // Close the file if it is open
    delete[] fBuffer;
}

void ifstream12::open(const char *aFileName)
{
    fIStream.open(aFileName, ifstream::binary); // Open file in binarY!!! dik
why linux this work
    assert(fIStream.is_open());                 // Success on opening the file
    // cout << "File opened: " << aFileName << endl;
}

void ifstream12::close()
{
    fIStream.close();
    // cout << "File closed." << endl;
}

bool ifstream12::isOpen() const
{
    return fIStream.is_open();
}

bool ifstream12::good() const
{   //good ;-;
    return fIStream.good();
```

```
}

// Checks if the end of the file and the buffer are both exhausted
bool ifstream12::eof() const
{
    //i hate this part of the code please help
    bool isExhausted = fIStream.eof() && (fByteCount == 0) && (fBitIndex == 7);
    // bool fileStreamEOF = fIStream.eof();          // Check if the file
stream has reached EOF
    // bool noBytesLeftInBuffer = (fByteCount == 0); // Check if there are no
bytes left in the buffer
    // bool allBitsRead = (fBitIndex == 7);          // Check if all bits in
the current byte have been read
    // cout << "Checking EOF - fIStream.eof(): " << fIStream.eof()
    //             << ", fByteCount: " << fByteCount
    //             << ", fBitIndex: " << fBitIndex
    //             << ", eof() result: " << isExhausted << endl;
    return isExhausted;
    // bool isExhausted = fileStreamEOF && noBytesLeftInBuffer && allBitsRead;
}

void ifstream12::reset()
{
    fByteIndex = 0; // Reset byte index to the beginning
    fBitIndex = 7;  // Reset bit index to the most significant bit
}

void ifstream12::fetch_data()
{
    if (fByteCount == 0)
    {
        fIStream.read(reinterpret_cast<char *>(fBuffer), fBufferSize);
        fByteCount = fIStream.gcount(); // count the byte that actual read

        // Force EOF detection if no bytes were read
        if (fByteCount == 0 && fIStream.peek() == EOF)
        {
            fIStream.setstate(ios::eofbit); // Set EOF flag explicitly
        }

        reset();
        // cout << "Fetched " << fByteCount << " bytes into buffer." << endl;
    }
}

optional<size_t> ifstream12::readBit()
{
    if (fByteCount == 0)
    {
        fetch_data();
        if (fByteCount == 0)
        {
            return nullopt;
        }
    }

    size_t currentByte = to_integer<size_t>(fBuffer[fByteIndex]);
    size_t bitValue = (currentByte & (1 << fBitIndex)) ? 1 : 0;

    fBitIndex--;
    if (fBitIndex < 0)
    {
        fBitIndex = 7;
        fByteIndex++;
        fByteCount--;

        if (fByteCount == 0 && !fIStream.eof())
        {
            fetch_data();
        }
    }

    // cout << "Read bit: " << bitValue
    //           << ", fByteIndex: " << fByteIndex
    //           << ", fBitIndex: " << fBitIndex
    //           << ", fByteCount: " << fByteCount
    //           << endl;

    return bitValue;
}

// // Overloaded >> operator
// ifstream12 &ifstream12::operator>>(size_t &aValue)
// {
//     aValue = 0;

//     for (int i = 0; i < 12; i++)
//     {
//         auto bit = readBit();
//         if (!bit.has_value())
//         {
//             // cout << "Reached EOF while reading 12 bits." << endl;
//             break;
//         }
//         aValue |= (bit.value() << i);
//     }

//     // cout << "Read 12-bit value: " << aValue << endl;
//     return *this;
// }

ifstream12 &ifstream12::operator>>(size_t &aValue)
{
    aValue = 0;

    // Loop to read 12 bits individually
    for (int i = 0; i < 12; i++)
    {
        // Read the next bit from the stream
        optional<size_t> bit = readBit();

        if (bit.has_value())
        {
            // Shift the bit to its correct position and add it to aValue
            size_t shiftedBit = bit.value() << i;
            aValue |= shiftedBit;
        }
        else
        {

            break;
        }
    }

    return *this;
}
```

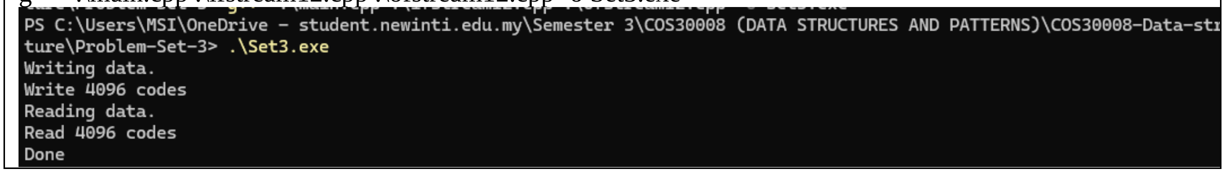
Output Terminal

Window Output terminal



```
PS C:\Users\MSI\OneDrive - student.newinti.edu.my\Semester 3\COS30008 (DATA STRUCTURES AND PATTERNS)\COS30008-Data-st
ture\Problem-Set-3> g++  .\main.cpp .\ifstream12.cpp .\ofstream12.cpp -o Set3.exe
PS C:\Users\MSI\OneDrive - student.newinti.edu.my\Semester 3\COS30008 (DATA STRUCTURES AND PATTERNS)\COS30008-Data-st
ture\Problem-Set-3> |
```

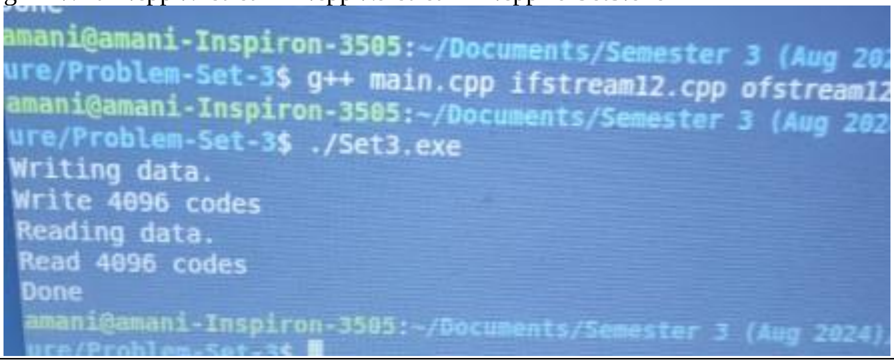
g++ .\main.cpp .\ifstream12.cpp .\ofstream12.cpp -o Set3.exe



```
PS C:\Users\MSI\OneDrive - student.newinti.edu.my\Semester 3\COS30008 (DATA STRUCTURES AND PATTERNS)\COS30008-Data-str
ture\Problem-Set-3> .\Set3.exe
Writing data.
Write 4096 codes
Reading data.
Read 4096 codes
Done
```

Linux Output Terminal

g++ .\main.cpp .\ifstream12.cpp .\ofstream12.cpp -o Set3.exe



```
amani@amani-Inspiron-3505:~/Documents/Semester 3 (Aug 202
ure/Problem-Set-3$ g++ main.cpp ifstream12.cpp ofstream12
amani@amani-Inspiron-3505:~/Documents/Semester 3 (Aug 202
ure/Problem-Set-3$ ./Set3.exe
Writing data.
Write 4096 codes
Reading data.
Read 4096 codes
Done
amani@amani-Inspiron-3505:~/Documents/Semester 3 (Aug 2024)
ure/Problem-Set-3$
```