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**Section:**

**BSCS-9A**

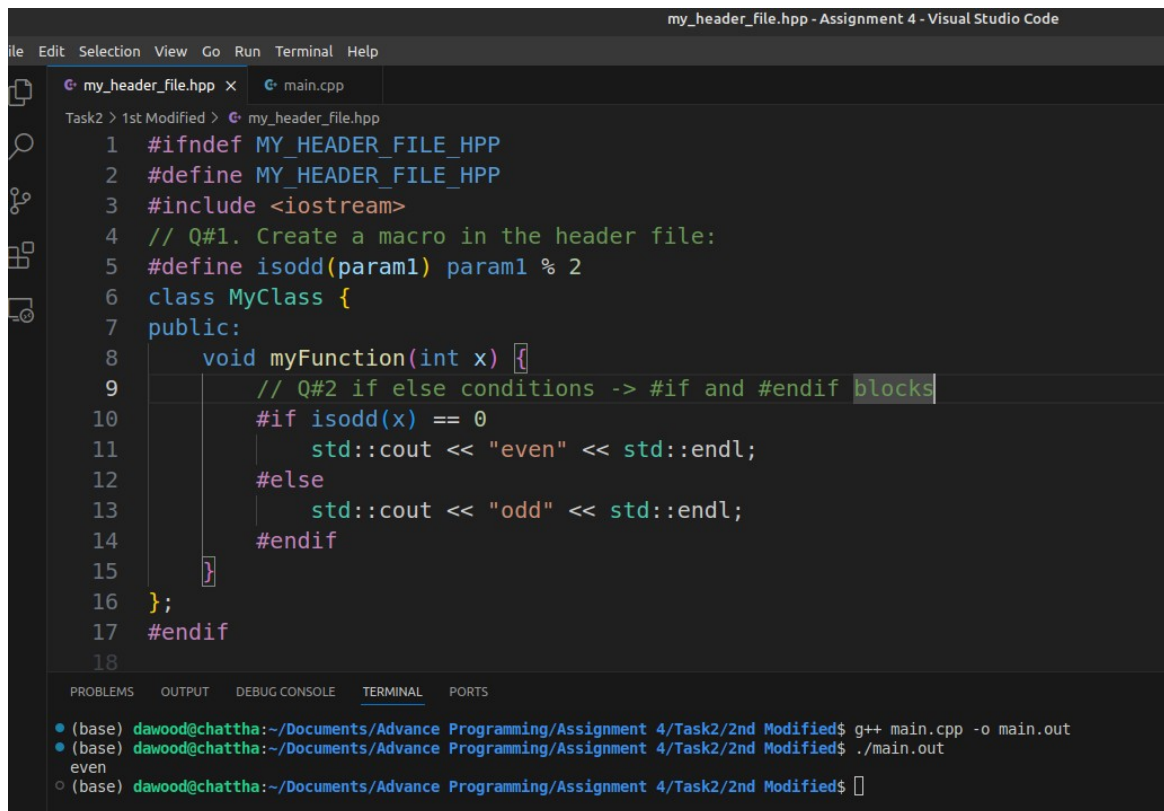
**Assignment no 4:**

**Build Automation (Pre-Processors)**

**Submitted to:**

**Dr. Omar Usman Khan**

## 1. Create a macro in the header file:



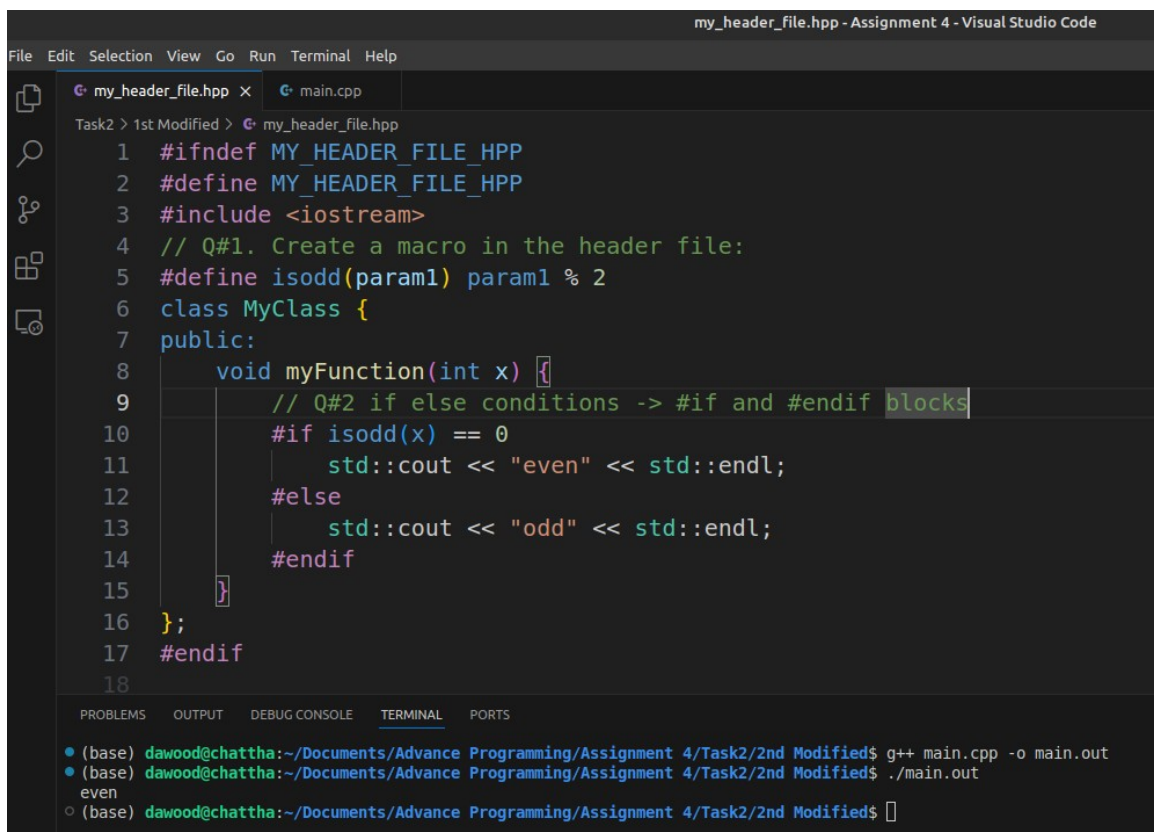
The screenshot shows the Visual Studio Code editor with a file named `my_header_file.hpp` open. The code defines a macro `isodd` and a class `MyClass` with a function `myFunction` that uses the macro. The terminal shows the compilation and execution of the program, which outputs "even".

```
1 #ifndef MY_HEADER_FILE_HPP
2 #define MY_HEADER_FILE_HPP
3 #include <iostream>
4 // Q#1. Create a macro in the header file:
5 #define isodd(param1) param1 % 2
6 class MyClass {
7 public:
8     void myFunction(int x) {
9         // Q#2 if else conditions -> #if and #endif blocks
10        #if isodd(x) == 0
11            std::cout << "even" << std::endl;
12        #else
13            std::cout << "odd" << std::endl;
14        #endif
15    }
16 };
17 #endif
18
```

Terminal output:

```
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$ g++ main.cpp -o main.out
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$ ./main.out
even
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$
```

## 2. And modify the if else conditions to be included in respective #if and #endif blocks. Example is below:



The screenshot shows the same Visual Studio Code editor with the `my_header_file.hpp` file. The code is identical to the previous one, but the terminal output now shows "even" followed by a blank line, indicating that the program was re-run after the modification.

```
1 #ifndef MY_HEADER_FILE_HPP
2 #define MY_HEADER_FILE_HPP
3 #include <iostream>
4 // Q#1. Create a macro in the header file:
5 #define isodd(param1) param1 % 2
6 class MyClass {
7 public:
8     void myFunction(int x) {
9         // Q#2 if else conditions -> #if and #endif blocks
10        #if isodd(x) == 0
11            std::cout << "even" << std::endl;
12        #else
13            std::cout << "odd" << std::endl;
14        #endif
15    }
16 };
17 #endif
18
```

Terminal output:

```
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$ g++ main.cpp -o main.out
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$ ./main.out
even
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$
```

### 3. Is the code giving expected behavior? Think and comment about what the problem is

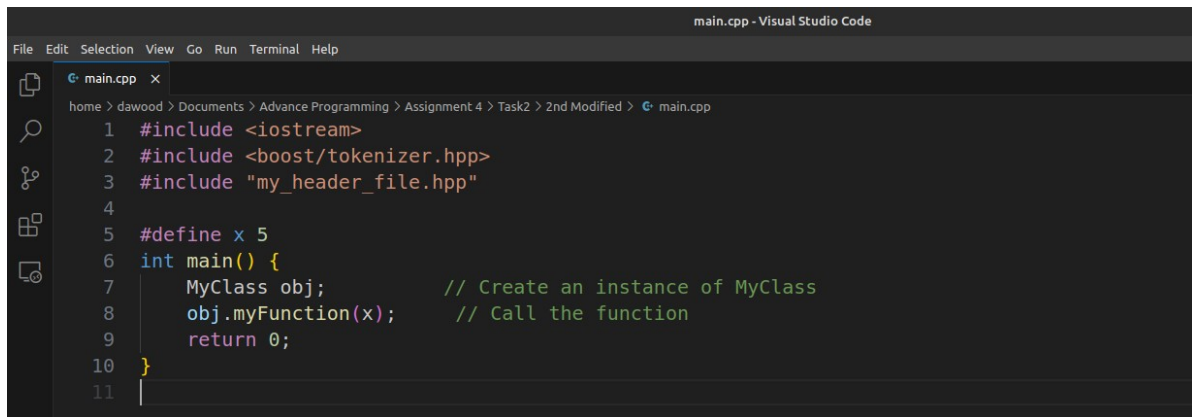
```
main.cpp - Assignment 4 - Visual Studio Code
File Edit Selection View Go Run Terminal Help
Task2 > 2nd Modified > main.cpp
1 #include <iostream>
2 #include <boost/tokenizer.hpp>
3 #include "my_header_file.hpp"
4
5 #define x 5
6 int main() {
7     MyClass obj;           // Create an instance of MyClass
8     obj.myFunction();       // Call the function
9     return 0;
10 }
11

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$ g++ main.cpp -o main.out
main.cpp: In function 'int main()':
main.cpp:8:19: error: no matching function for call to 'MyClass::myFunction()'
      8 |     obj.myFunction();    // Call the function
        |           ^
In file included from main.cpp:3:
my_header_file.hpp:10:10: note: candidate: 'void MyClass::myFunction(int)'
     10 |     void myFunction(int x) {
        |          ^
my_header_file.hpp:10:10: note: candidate expects 1 argument, 0 provided
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$
```

```
main.cpp - Assignment 4 - Visual Studio Code
File Edit Selection View Go Run Terminal Help
Task2 > 2nd Modified > main.cpp
1 #include <iostream>
2 #include <boost/tokenizer.hpp>
3 #include "my_header_file.hpp"
4
5 #define x 5
6 int main() {
7     MyClass obj;           // Create an instance of MyClass
8     obj.myFunction(x);     // Call the function
9     return 0;
10 }
11

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$ g++ main.cpp -o main.out
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$ ./main.out
even
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$
```

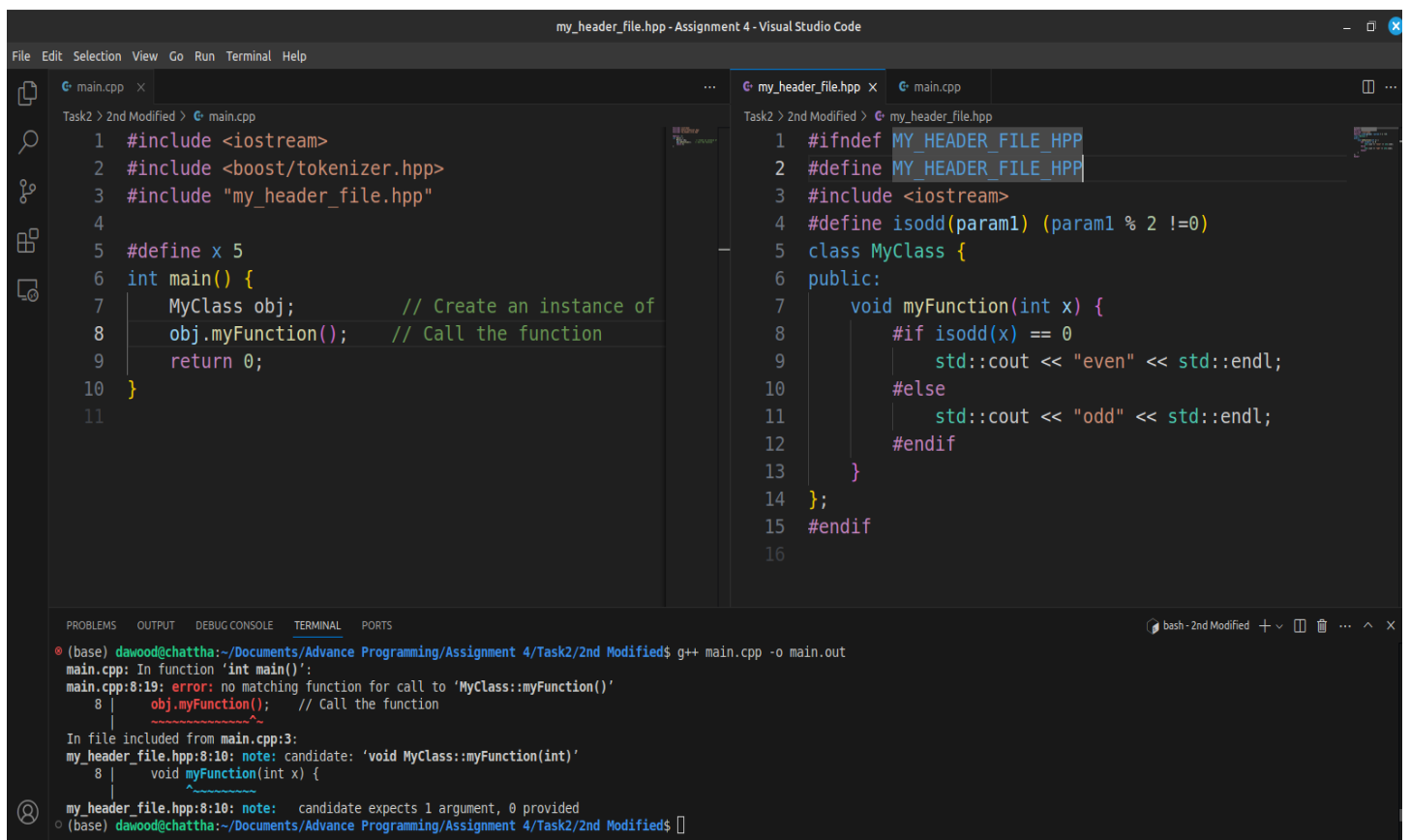
4. In the main file, modify `obj.myFunction(5);` to a compile-time variable as:



The screenshot shows the Visual Studio Code editor with the file `main.cpp` open. The code is as follows:

```
1 #include <iostream>
2 #include <boost/tokenizer.hpp>
3 #include "my_header_file.hpp"
4
5 #define x 5
6 int main() {
7     MyClass obj;           // Create an instance of MyClass
8     obj.myFunction(x);      // Call the function
9     return 0;
10 }
11
```

5. Is the code giving expected behavior? Think and comment about what the problem is.



The screenshot shows the Visual Studio Code editor with two files open: `main.cpp` and `my_header_file.hpp`. The `main.cpp` file has been modified to use a compile-time variable:

```
1 #include <iostream>
2 #include <boost/tokenizer.hpp>
3 #include "my_header_file.hpp"
4
5 #define x 5
6 int main() {
7     MyClass obj;           // Create an instance of
8     obj.myFunction();       // Call the function
9     return 0;
10 }
11
```

The `my_header_file.hpp` file contains the following code:

```
1 #ifndef MY_HEADER_FILE_HPP
2 #define MY_HEADER_FILE_HPP
3 #include <iostream>
4 #define isodd(param1) (param1 % 2 != 0)
5 class MyClass {
6 public:
7     void myFunction(int x) {
8         #if isodd(x) == 0
9             std::cout << "even" << std::endl;
10        #else
11            std::cout << "odd" << std::endl;
12        #endif
13    }
14 };
15 #endif
16
```

The terminal at the bottom shows the compilation command and the resulting errors:

```
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$ g++ main.cpp -o main.out
main.cpp: In function 'int main()':
main.cpp:8:19: error: no matching function for call to 'MyClass::myFunction()'
8 |     obj.myFunction(); // Call the function
  |     ~~~~~^~~~~~
In file included from main.cpp:3:
my_header_file.hpp:8:10: note: candidate: 'void MyClass::myFunction(int)'
8 |     void myFunction(int x) {
  |     ~~~~~^~~~~~
my_header_file.hpp:8:10: note: candidate expects 1 argument, 0 provided
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$
```

6. Now move the `#define x 5` to the `my_headerfile.hpp`. Is the code giving expected behavior? Comment about the matter.

Ans:

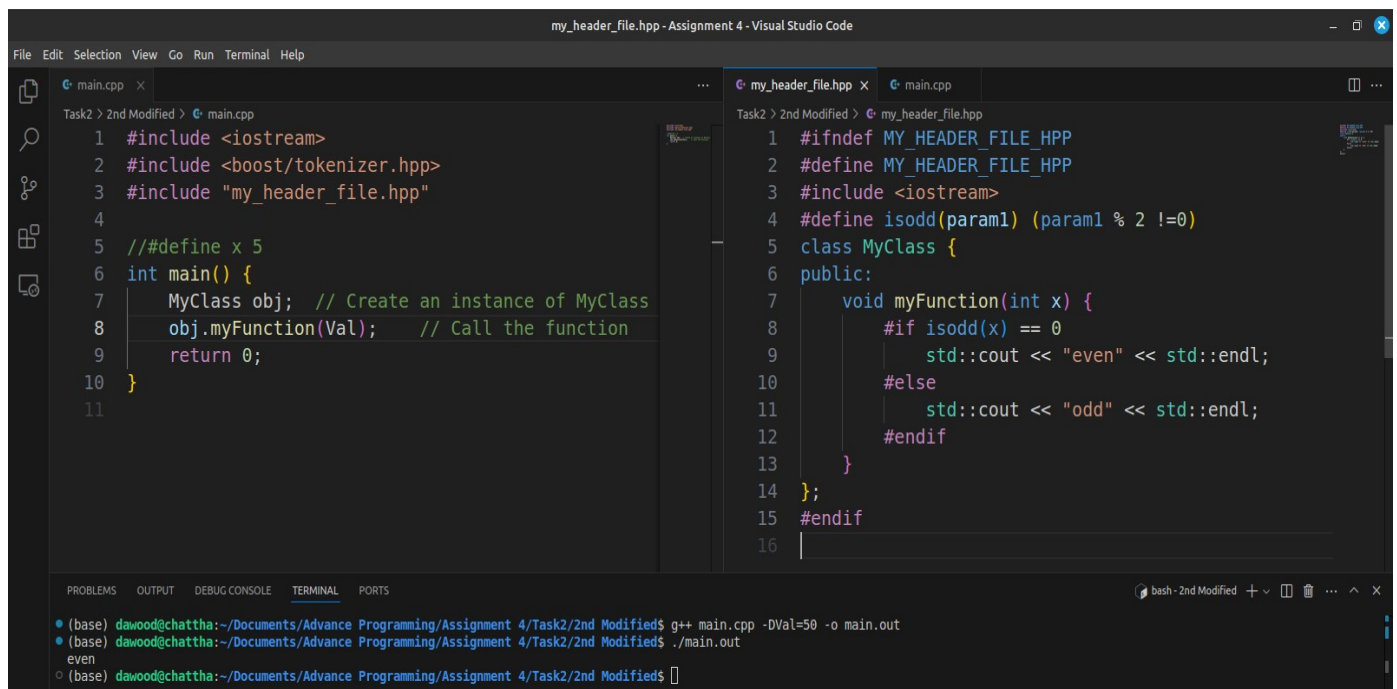
With `#define x 5` in the header file, the function will always treat `x` as 5, printing "odd". This makes the code less flexible because `x` is now fixed.

7. Now delete the line `#define x 5` even from `my_header_file.hpp`. And instead, run this command as:

Ans:

The code should work as expected, printing "odd" since `x` is defined as 5 at compile time through the compiler option.

8. Is the code giving expected behavior?



The screenshot shows a Visual Studio Code editor with two files open: `main.cpp` and `my_header_file.hpp`. The `main.cpp` file contains the following code:

```
1 #include <iostream>
2 #include <boost/tokenizer.hpp>
3 #include "my_header_file.hpp"
4
5 // #define x 5
6 int main() {
7     MyClass obj; // Create an instance of MyClass
8     obj.myFunction(Val); // Call the function
9     return 0;
10 }
11
```

The `my_header_file.hpp` file contains the following code:

```
1 #ifndef MY_HEADER_FILE_HPP
2 #define MY_HEADER_FILE_HPP
3 #include <iostream>
4 #define isodd(param1) (param1 % 2 != 0)
5 class MyClass {
6 public:
7     void myFunction(int x) {
8         #if isodd(x) == 0
9             std::cout << "even" << std::endl;
10        #else
11            std::cout << "odd" << std::endl;
12        #endif
13    }
14 };
15 #endif
16
```

The terminal at the bottom shows the following commands and output:

```
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$ g++ main.cpp -DVal=50 -o main.out
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$ ./main.out
even
(base) dawood@chattha:~/Documents/Advance Programming/Assignment 4/Task2/2nd Modified$
```