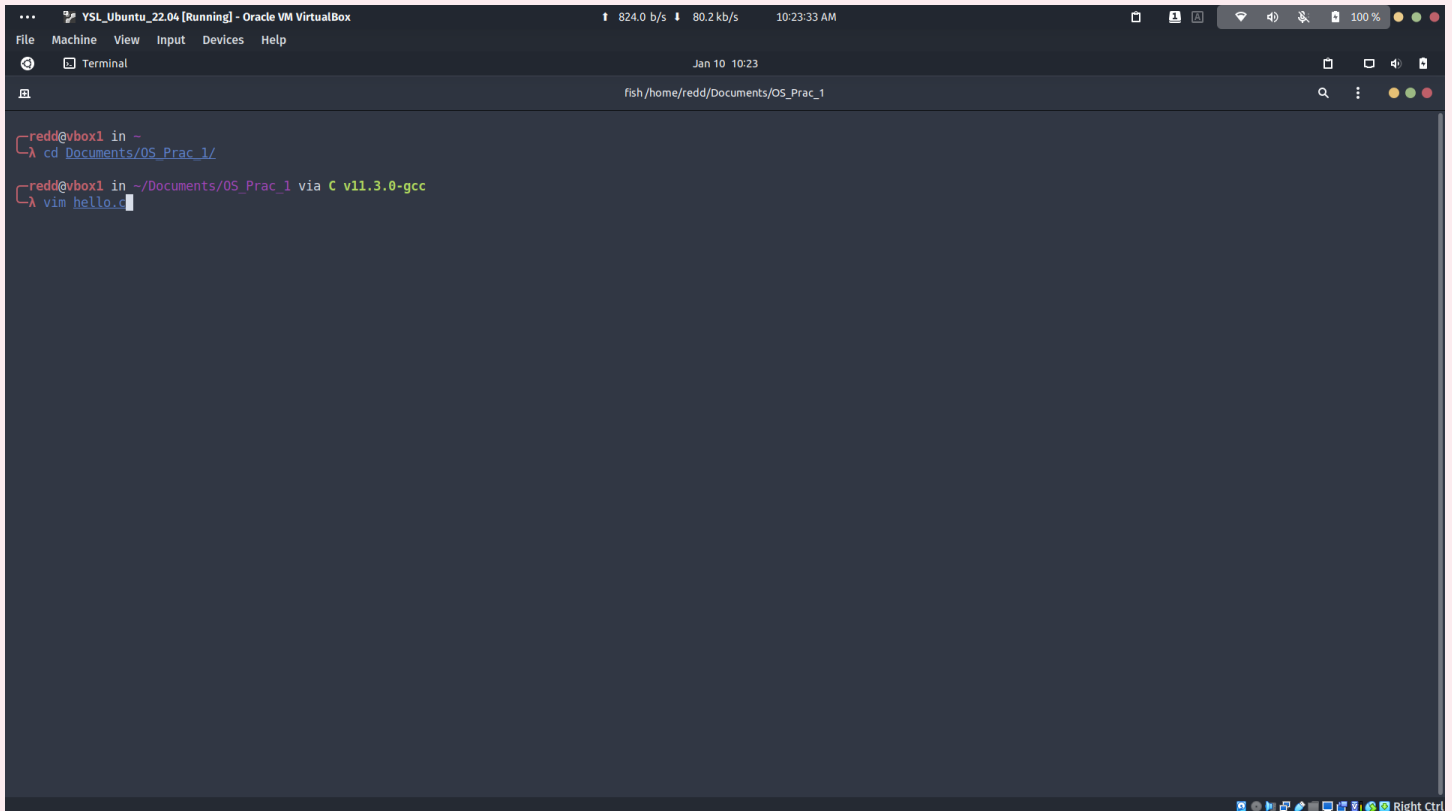


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**OS Practical 1**

**Aim :** Learn how to recompile source codes of various projects / programs partially using Makefile utility

1. Write a simple “Hello World” program. Move the part that outputs the text (i.e., the printf() function call), into a separate file hello.c. Edit an appropriate interface file hello.h in order to use the subroutine in the main.c program. Write a Makefile that maintains the program structure. Use a variable CC in the makefile to define the compiler, e.g., CC=gcc

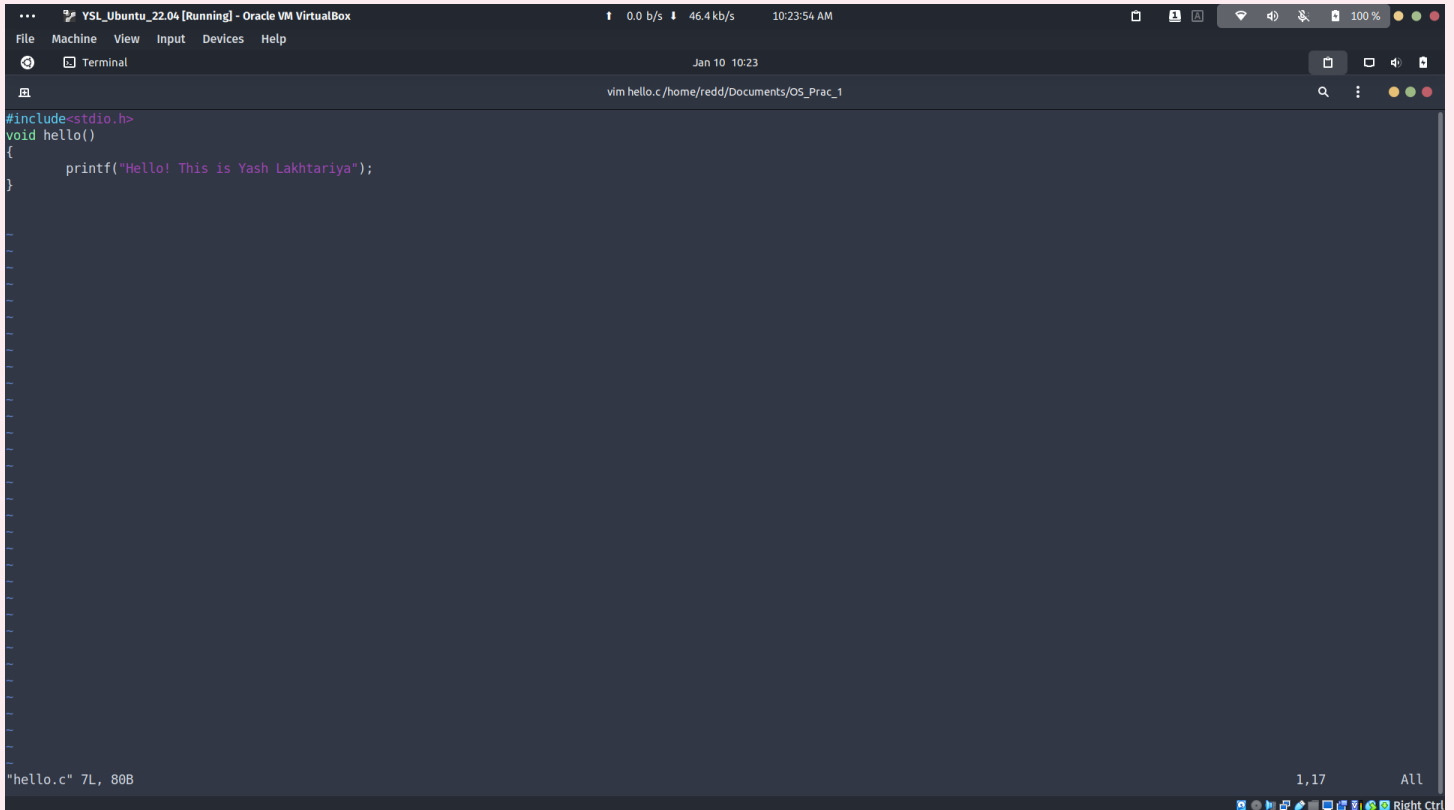


The screenshot shows a terminal window titled "YSL\_Ubuntu\_22.04 [Running] - Oracle VM VirtualBox". The terminal output is as follows:

```
redd@vbox1 in ~  
└─$ cd Documents/OS_Prac_1/  
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc  
└─$ vim hello.c
```

The terminal window has a menu bar with "File", "Machine", "View", "Input", "Devices", and "Help". The status bar at the bottom shows various system icons and the text "Right Ctrl".

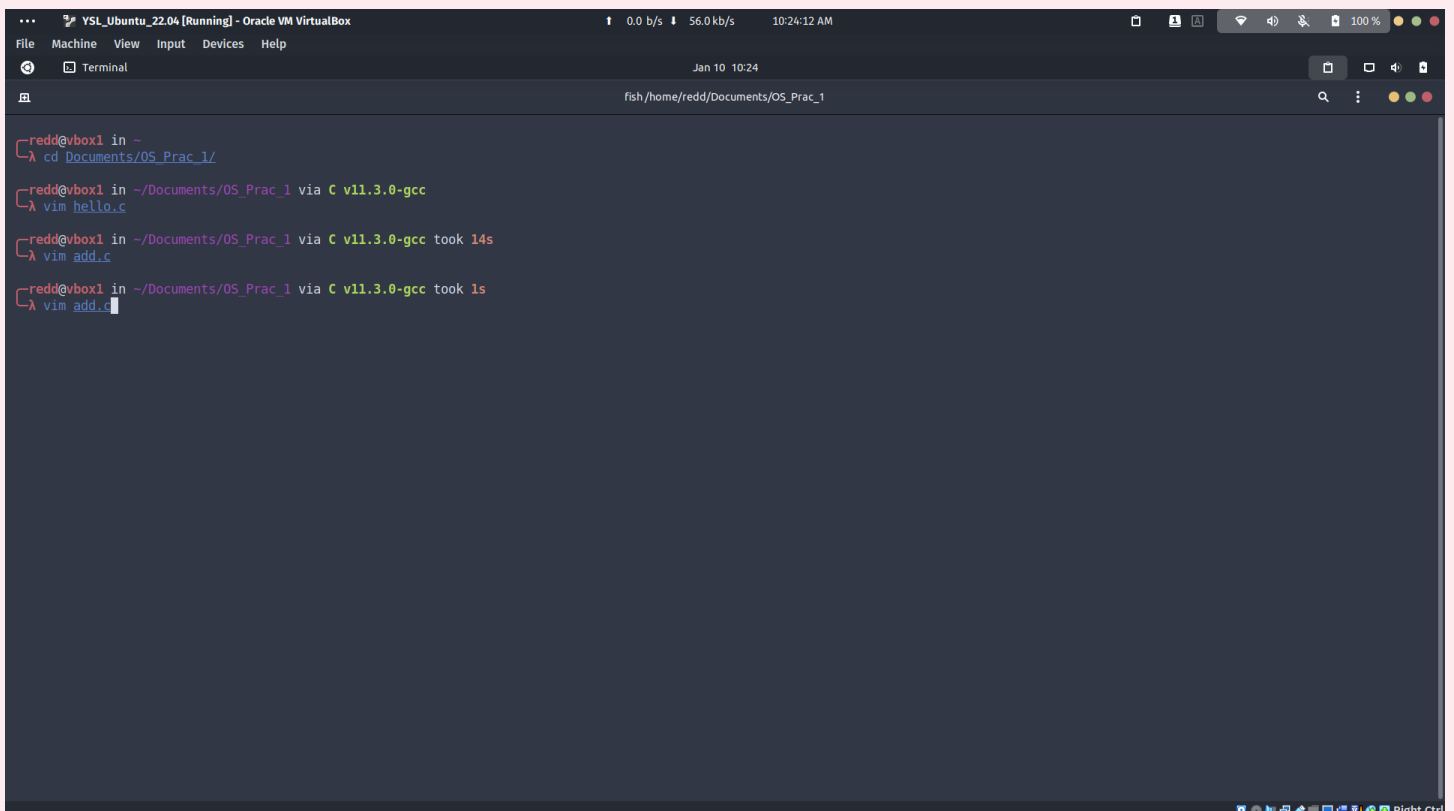
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**OS Practical 1**



The screenshot shows a terminal window titled "YSL\_Ubuntu\_22.04 [Running] - Oracle VM VirtualBox". The terminal is running the vim editor, editing a file named "hello.c" located at "/home/redd/Documents/OS\_Prac\_1". The code in the file is as follows:

```
#include<stdio.h>
void hello()
{
    printf("Hello! This is Yash Lakhtariya");
}
```

The terminal status bar at the bottom indicates the file size is 7L, 80B and the cursor is at line 1, column 17.



The screenshot shows a terminal window titled "YSL\_Ubuntu\_22.04 [Running] - Oracle VM VirtualBox". The terminal is running the fish shell, editing a file named "hello.c" located at "/home/redd/Documents/OS\_Prac\_1". The terminal shows the following commands and output:

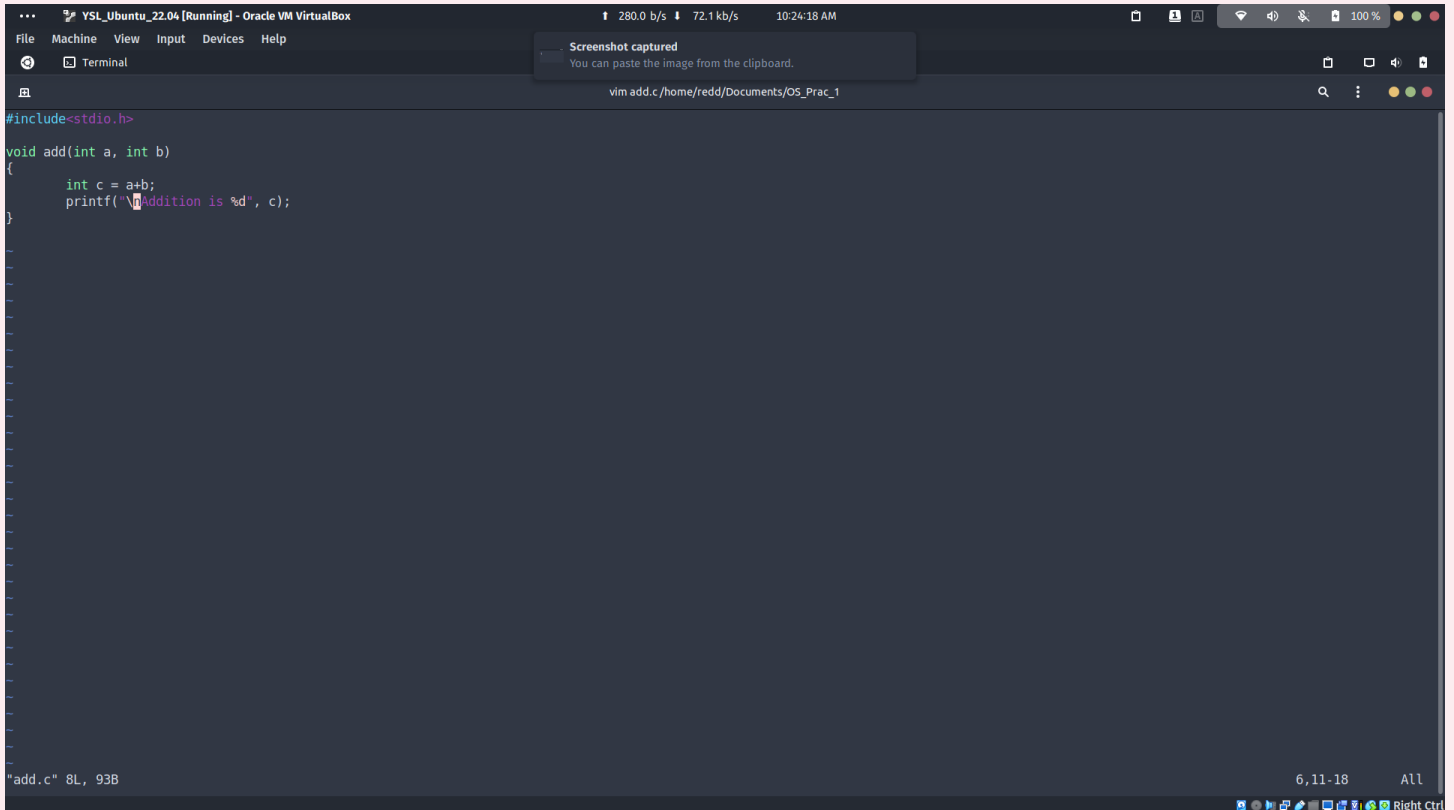
```
redd@vbox1 in ~
λ cd Documents/OS_Prac_1/

redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc
λ vim hello.c

redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 14s
λ vim add.c

redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 1s
λ vim add.c
```

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Enrollment number - 21162101012  
Branch - CBA    Batch - 41  
OS Practical 1

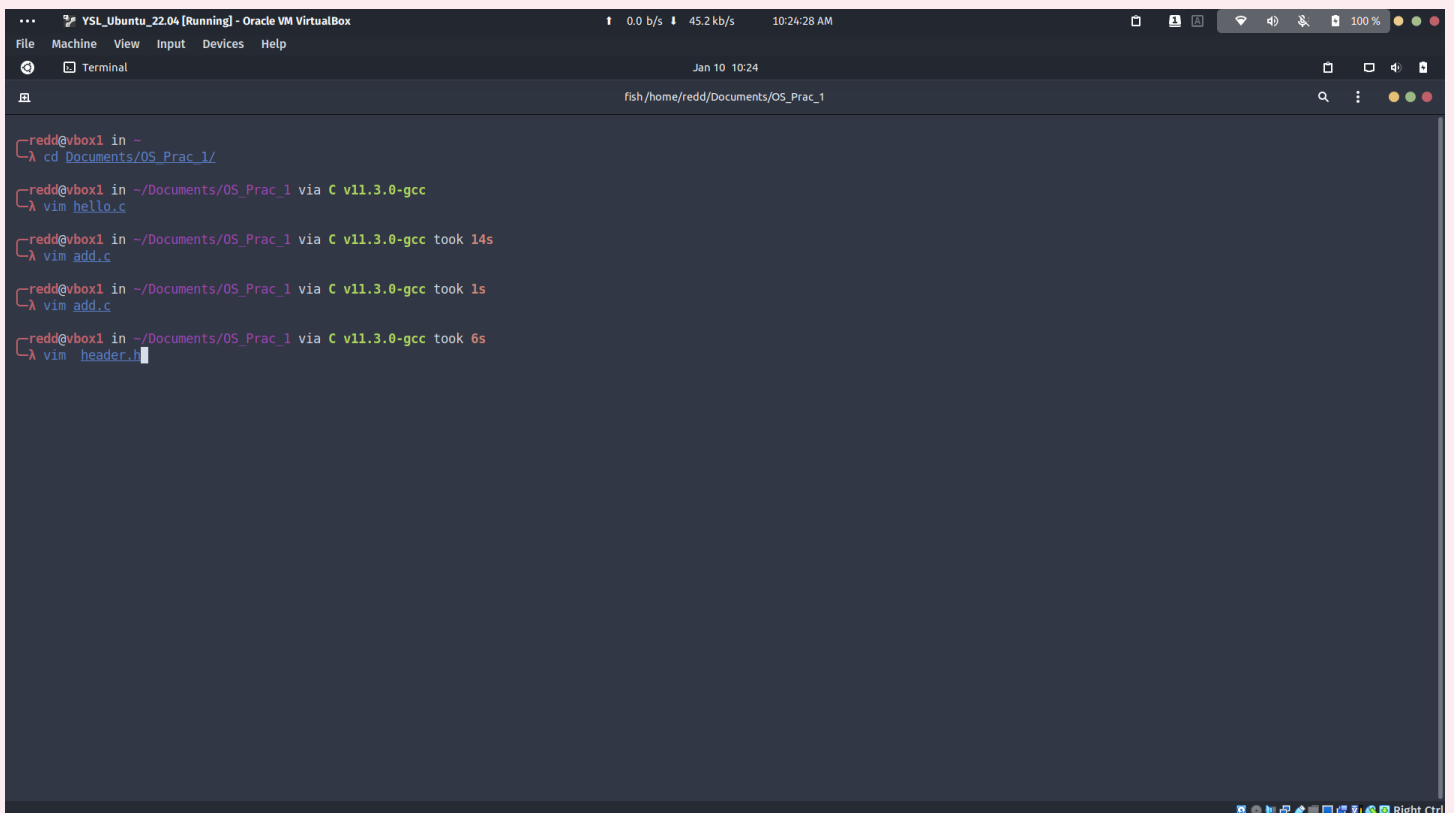


The screenshot shows a terminal window titled "YSL\_Ubuntu\_22.04 [Running] - Oracle VM VirtualBox". The terminal is running the vim editor on the file `add.c` located at `/home/redd/Documents/OS_Prac_1`. The code visible in the editor is:

```
#include<stdio.h>

void add(int a, int b)
{
    int c = a+b;
    printf("\nAddition is %d", c);
}
```

A status bar at the bottom of the terminal indicates the file size: "add.c" 8L, 93B. A notification box at the top center says "Screenshot captured. You can paste the image from the clipboard."



The screenshot shows a terminal window titled "YSL\_Ubuntu\_22.04 [Running] - Oracle VM VirtualBox". The terminal is running the fish shell on the file `/home/redd/Documents/OS_Prac_1`. The commands and output shown are:

```
redd@vbox1 in ~
λ cd Documents/OS_Prac_1/

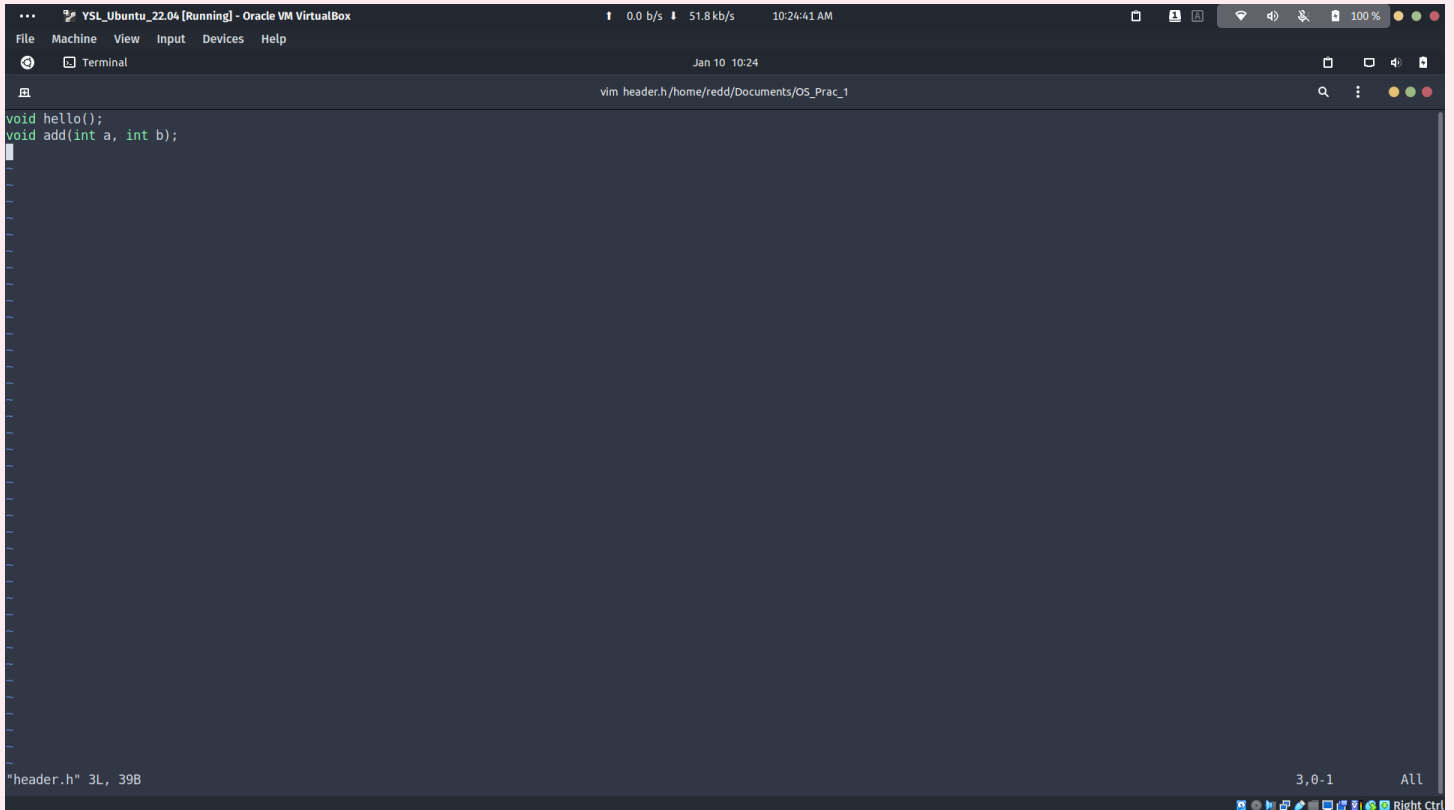
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc
λ vim hello.c

redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 14s
λ vim add.c

redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 1s
λ vim add.c

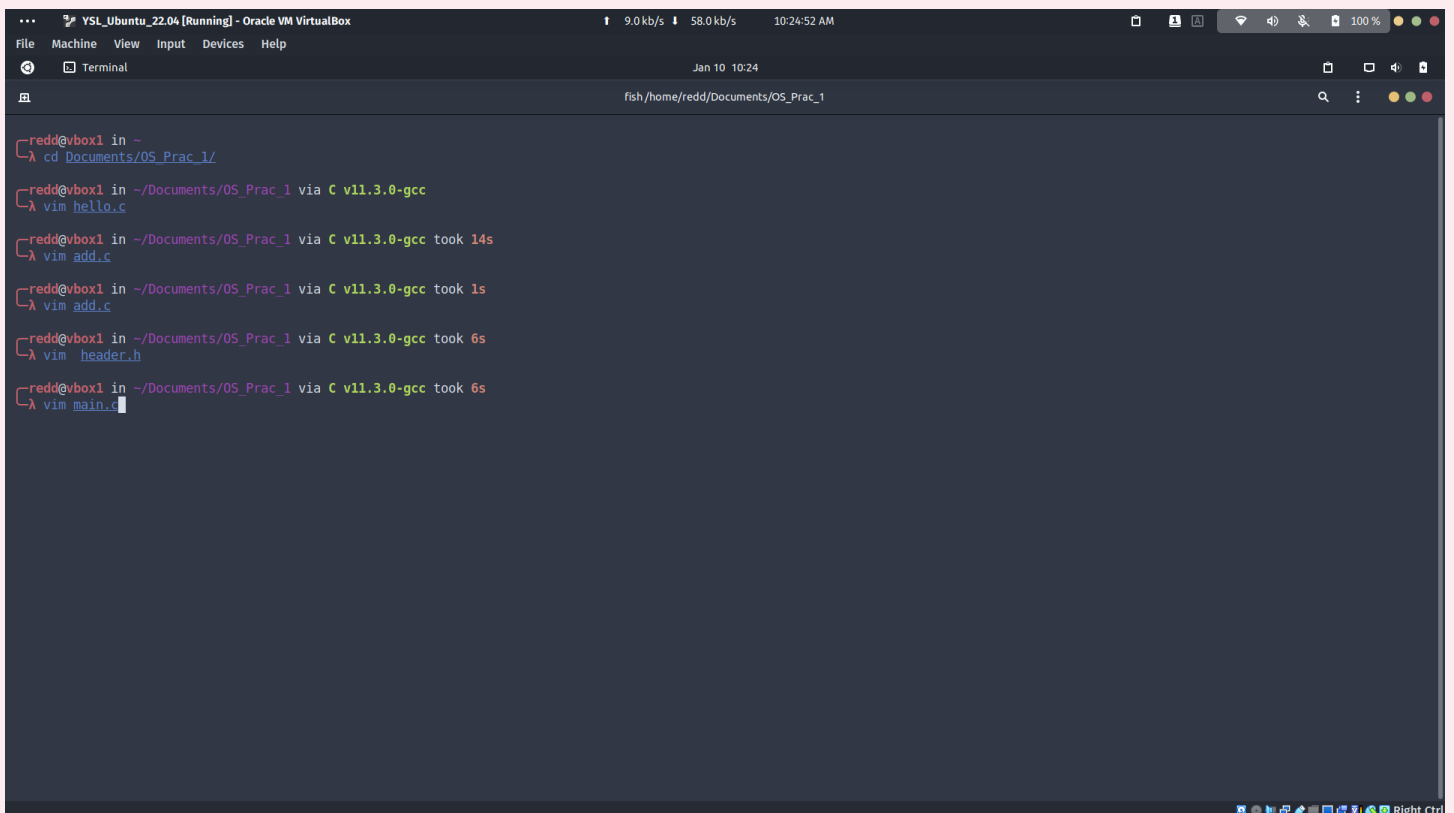
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 6s
λ vim header.h
```

Name - Yash Lakhtariya  
Enrollment number - 21162101012  
Branch - CBA    Batch - 41  
OS Practical 1



This screenshot shows a terminal window within an Oracle VM VirtualBox environment. The window title is "YSL\_Ubuntu\_22.04 [Running] - Oracle VM VirtualBox". The terminal displays the contents of a file named `header.h` located at `/home/redd/Documents/OS_Prac_1`. The file contains two function declarations: `void hello();` and `void add(int a, int b);`. The status bar at the bottom indicates the file is 3 lines long and 39 bytes in size.

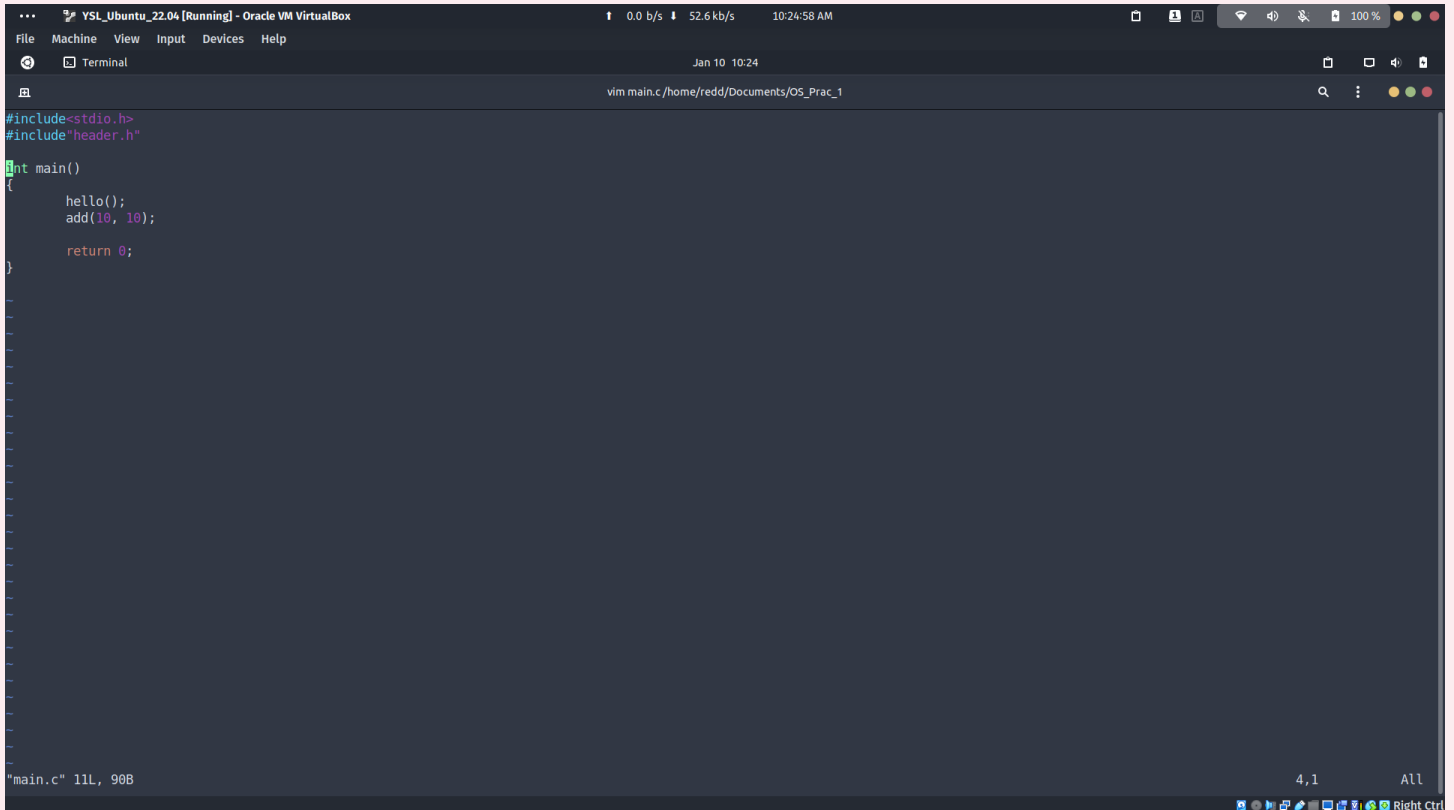
```
YSL_Ubuntu_22.04 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Terminal
Jan 10 10:24
vim header.h/home/redd/Documents/OS_Prac_1
void hello();
void add(int a, int b);
"header.h" 3L, 39B
```



This screenshot shows a terminal window in the same Oracle VM VirtualBox environment. It displays a sequence of commands and vim editor sessions. The user navigates to the `Documents/OS_Prac_1` directory and uses vim to create and edit several files: `hello.c`, `add.c`, `header.h`, and `main.c`. Each vim session is preceded by a command prompt showing the current directory and the gcc compiler version.

```
YSL_Ubuntu_22.04 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Terminal
Jan 10 10:24
fish /home/redd/Documents/OS_Prac_1
redd@vbox1 in ~
λ cd Documents/OS_Prac_1/
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc
λ vim hello.c
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 14s
λ vim add.c
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 1s
λ vim add.c
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 6s
λ vim header.h
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 6s
λ vim main.c
```

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**OS Practical 1**



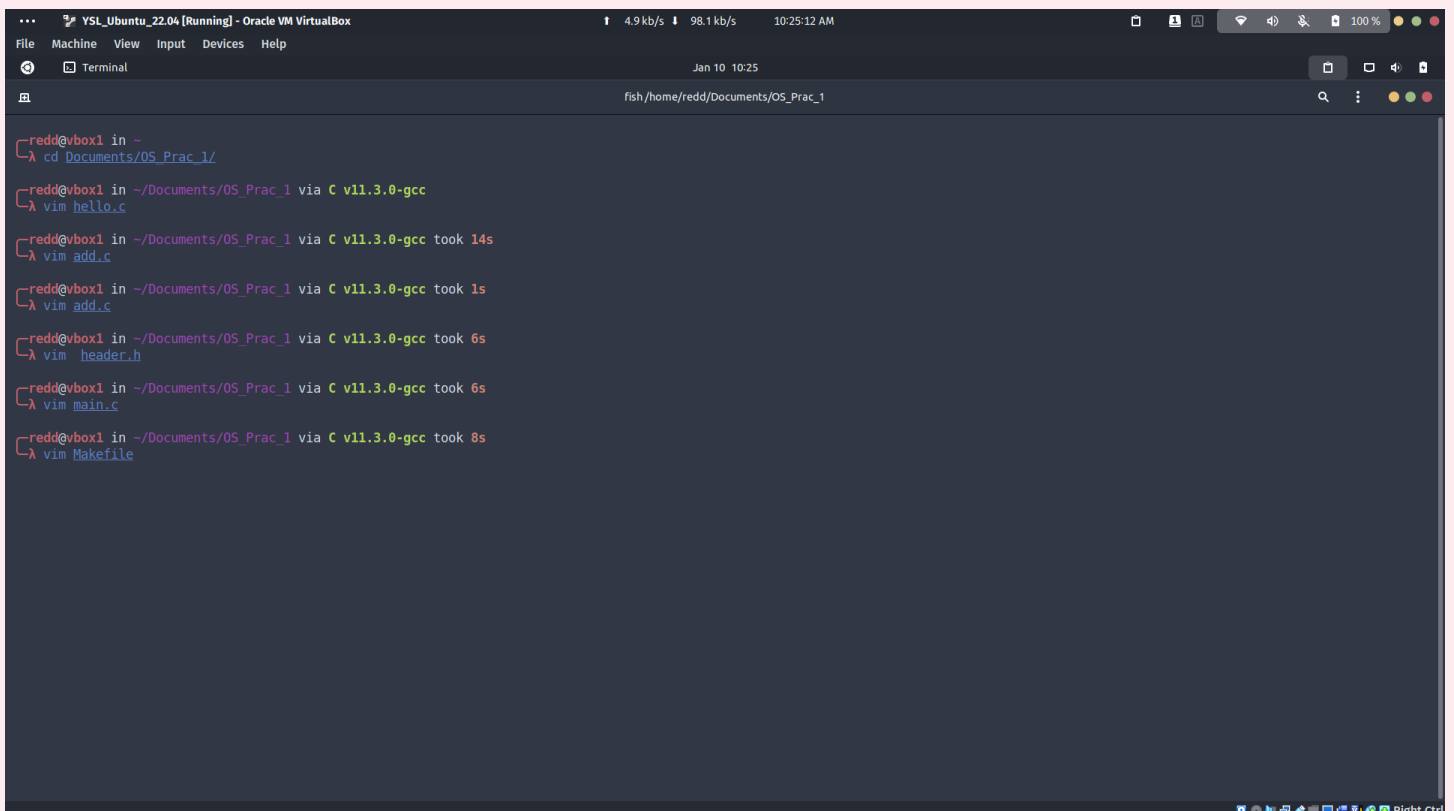
The screenshot shows a terminal window titled "YSL\_Ubuntu\_22.04 [Running] - Oracle VM VirtualBox". The terminal is running the vim editor, editing the file "main.c" located at "/home/redd/Documents/OS\_Prac\_1". The code in the file is as follows:

```
#include<stdio.h>
#include"header.h"

int main()
{
    hello();
    add(10, 10);

    return 0;
}
```

The terminal status bar at the bottom indicates "main.c" 11L, 90B. The window title bar shows the file path "vim main.c /home/redd/Documents/OS\_Prac\_1".



The screenshot shows a terminal window titled "YSL\_Ubuntu\_22.04 [Running] - Oracle VM VirtualBox". The terminal is running the fish shell, and the user is in the directory "/home/redd/Documents/OS\_Prac\_1". The user has executed several commands, and the terminal shows the execution time for each command:

```
redd@vbox1 in ~
λ cd Documents/OS_Prac_1/

redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc
λ vim hello.c

redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 14s
λ vim add.c

redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 1s
λ vim add.c

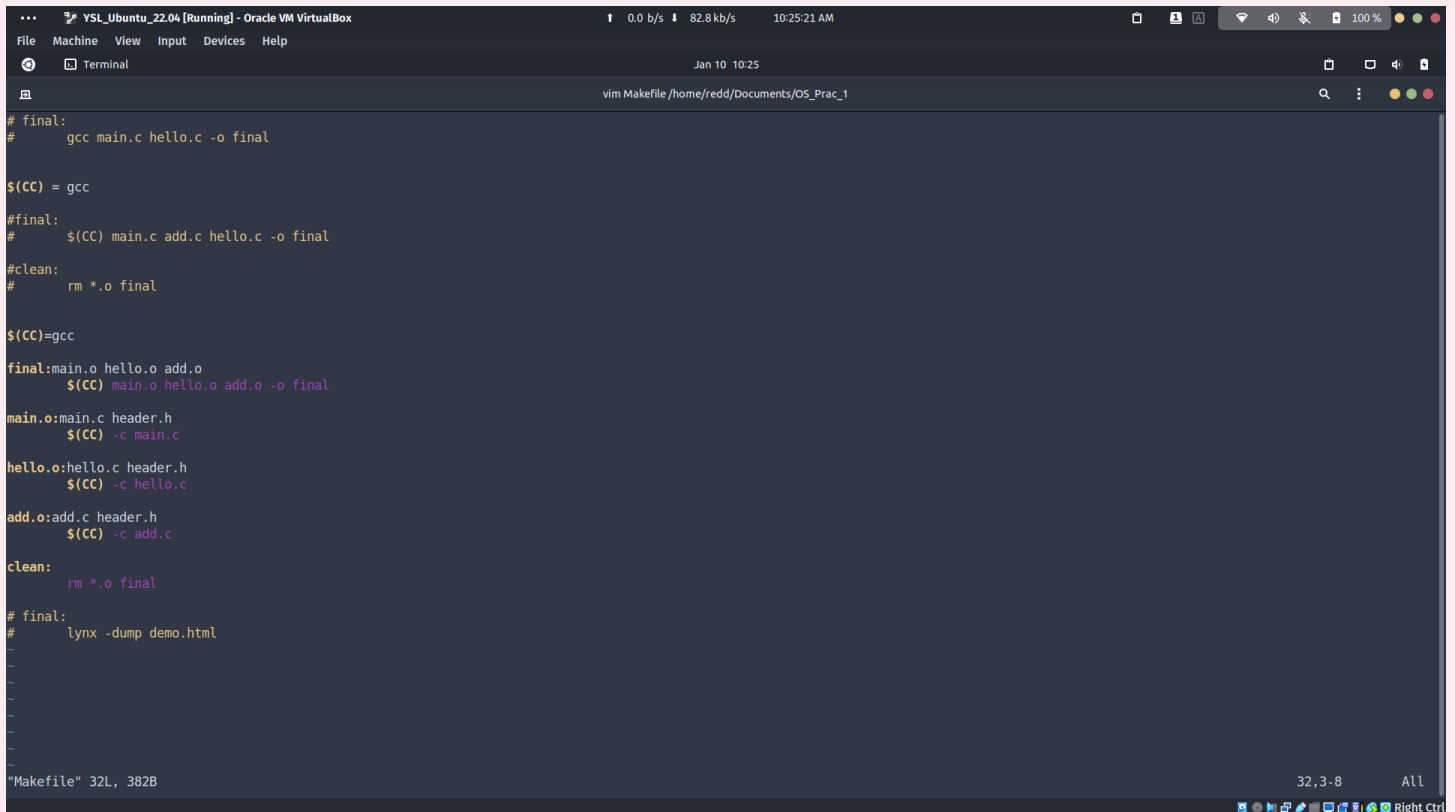
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 6s
λ vim header.h

redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 6s
λ vim main.c

redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 8s
λ vim Makefile
```

The terminal status bar at the bottom indicates the file path "fish /home/redd/Documents/OS\_Prac\_1". The window title bar shows the file path "fish /home/redd/Documents/OS\_Prac\_1".

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**Enrollment number - 21162101012**  
**Branch - CBA    Batch - 41**  
**OS Practical 1**



```
YSL_Ubuntu_22.04 [Running] - Oracle VM VirtualBox
0.0 b/s 82.8 kb/s 10:25:21 AM
File Machine View Input Devices Help
Terminal
Jan 10 10:25
vim Makefile /home/redd/Documents/OS_Prac_1

# final:
# gcc main.c hello.c -o final

$(CC) = gcc

#final:
# $(CC) main.c add.c hello.c -o final

#clean:
# rm *.o final

$(CC)=gcc

final:main.o hello.o add.o
$(CC) main.o hello.o add.o -o final

main.o:main.c header.h
$(CC) -c main.c

hello.o:hello.c header.h
$(CC) -c hello.c

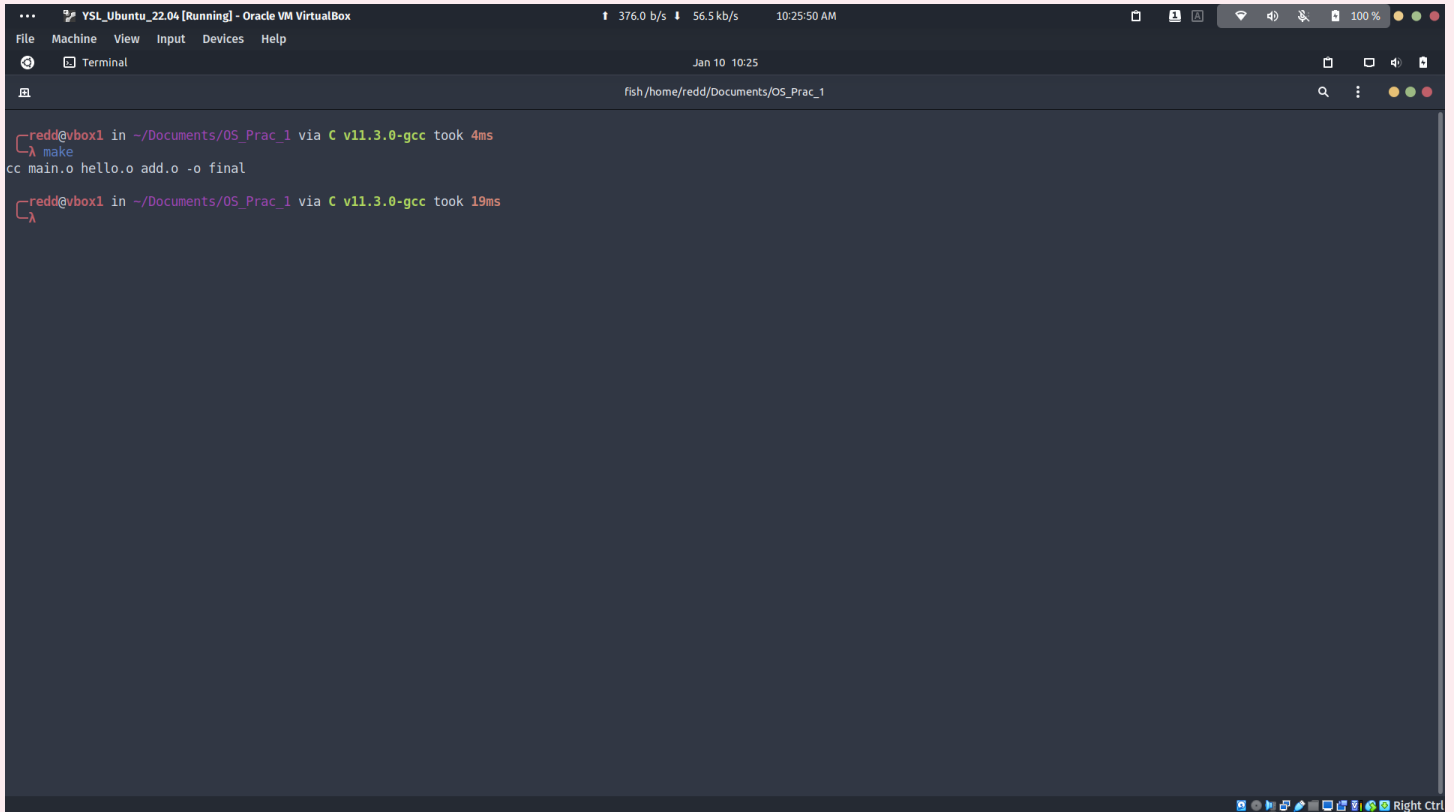
add.o:add.c header.h
$(CC) -c add.c

clean:
rm *.o final

# final:
# lynx -dump demo.html

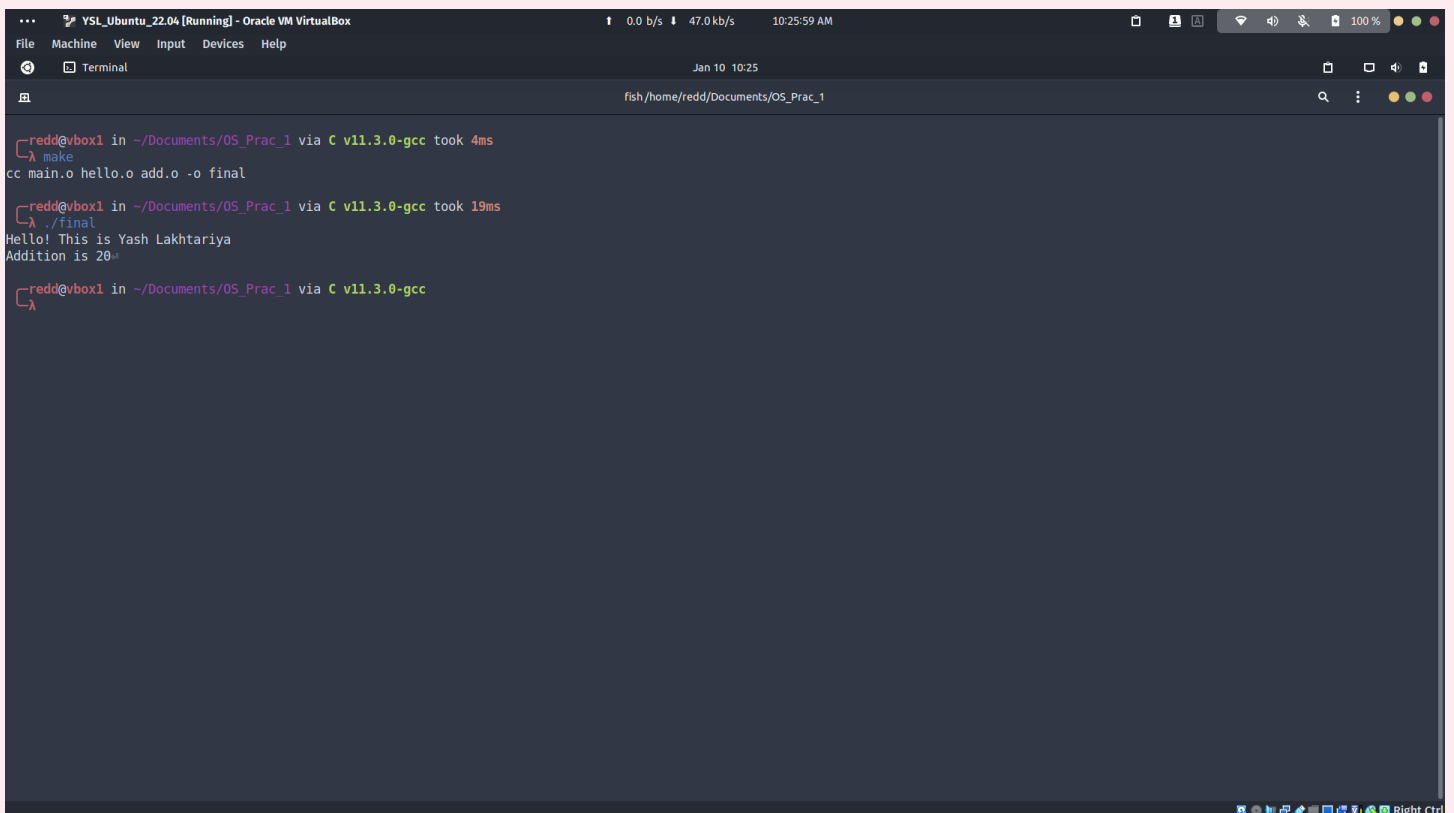
"Makefile" 32L, 382B
32,3-8 All
Right Ctrl
```

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**Enrollment number - 21162101012**  
**Branch - CBA    Batch - 41**  
**OS Practical 1**



The screenshot shows a terminal window titled "YSL\_Ubuntu\_22.04 [Running] - Oracle VM VirtualBox". The terminal displays the following commands and output:

```
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 4ms
λ make
cc main.o hello.o add.o -o final
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 19ms
```

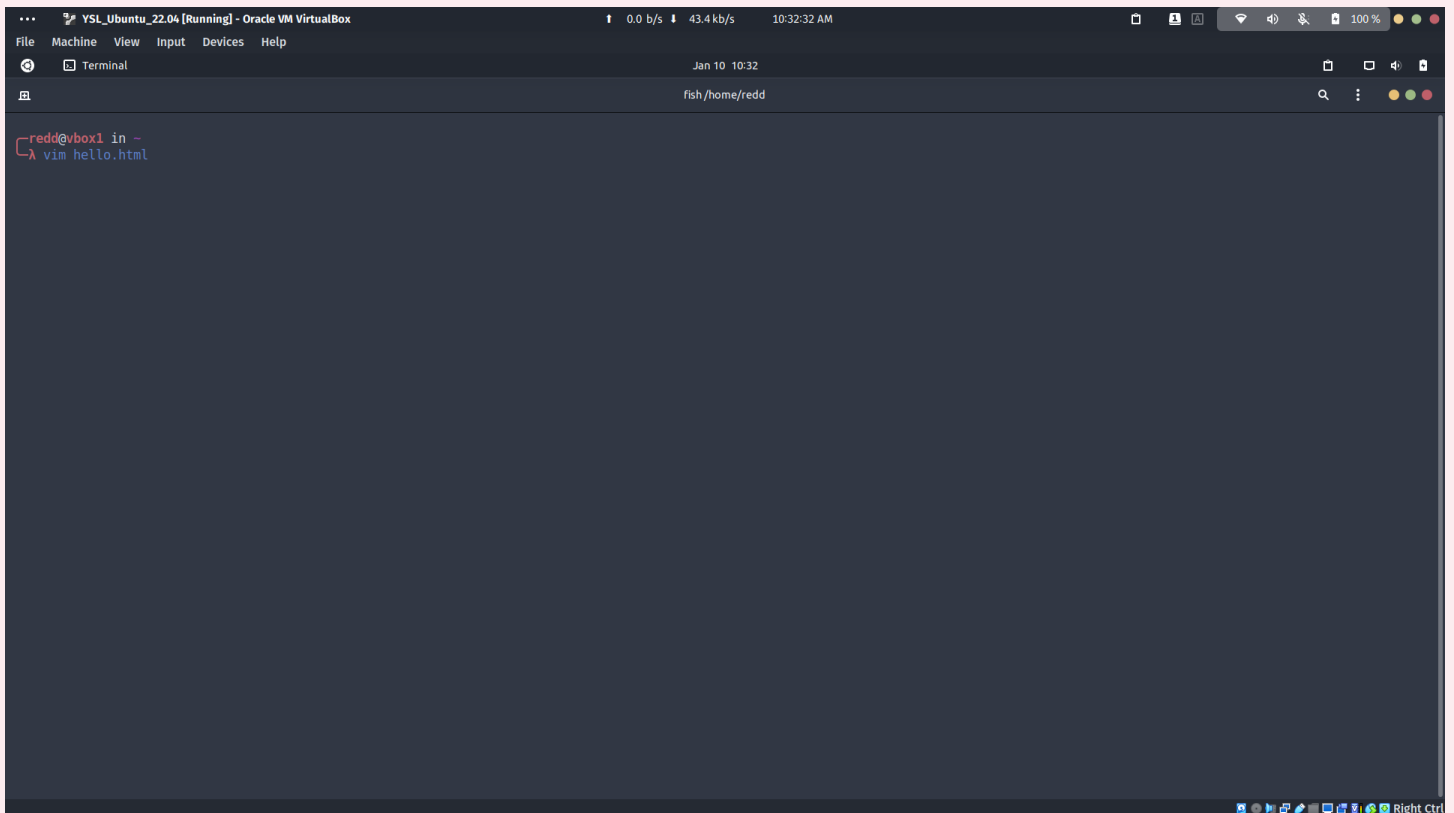


The screenshot shows the same terminal window as above, but with additional commands and output:

```
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 4ms
λ make
cc main.o hello.o add.o -o final
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc took 19ms
λ ./final
Hello! This is Yash Lakhtariya
Addition is 20
redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc
```

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**Branch - CBA    Batch - 41**  
**OS Practical 1**

2. Create a Makefile that converts any HTML file into text using the suffix rules.  
(.html to .txt file conversion)

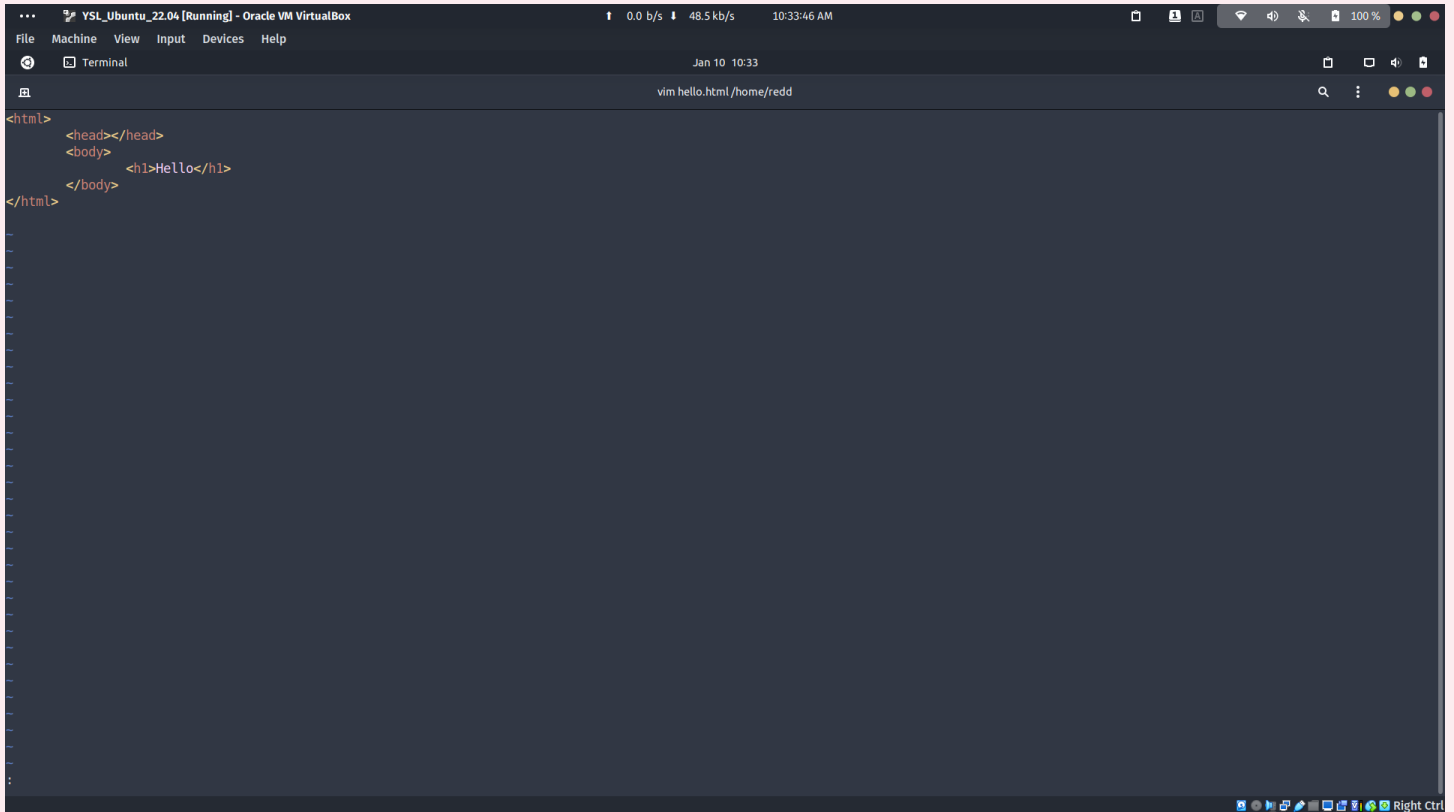


The screenshot shows a terminal window titled "YSL\_Ubuntu\_22.04 [Running] - Oracle VM VirtualBox". The window has a menu bar with "File", "Machine", "View", "Input", "Devices", and "Help". Below the menu bar is a toolbar with icons for "Terminal", "Jan 10 10:32", and "fish/home/redd". The terminal content shows a shell prompt "redd@vbox1 in ~" and a command "vim hello.html" entered on the next line. The terminal window has a dark background and a light-colored text. The bottom of the window shows a taskbar with various icons and the text "Right Ctrl".

```
YSL_Ubuntu_22.04 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Terminal
Jan 10 10:32
fish/home/redd
redd@vbox1 in ~
vim hello.html
```

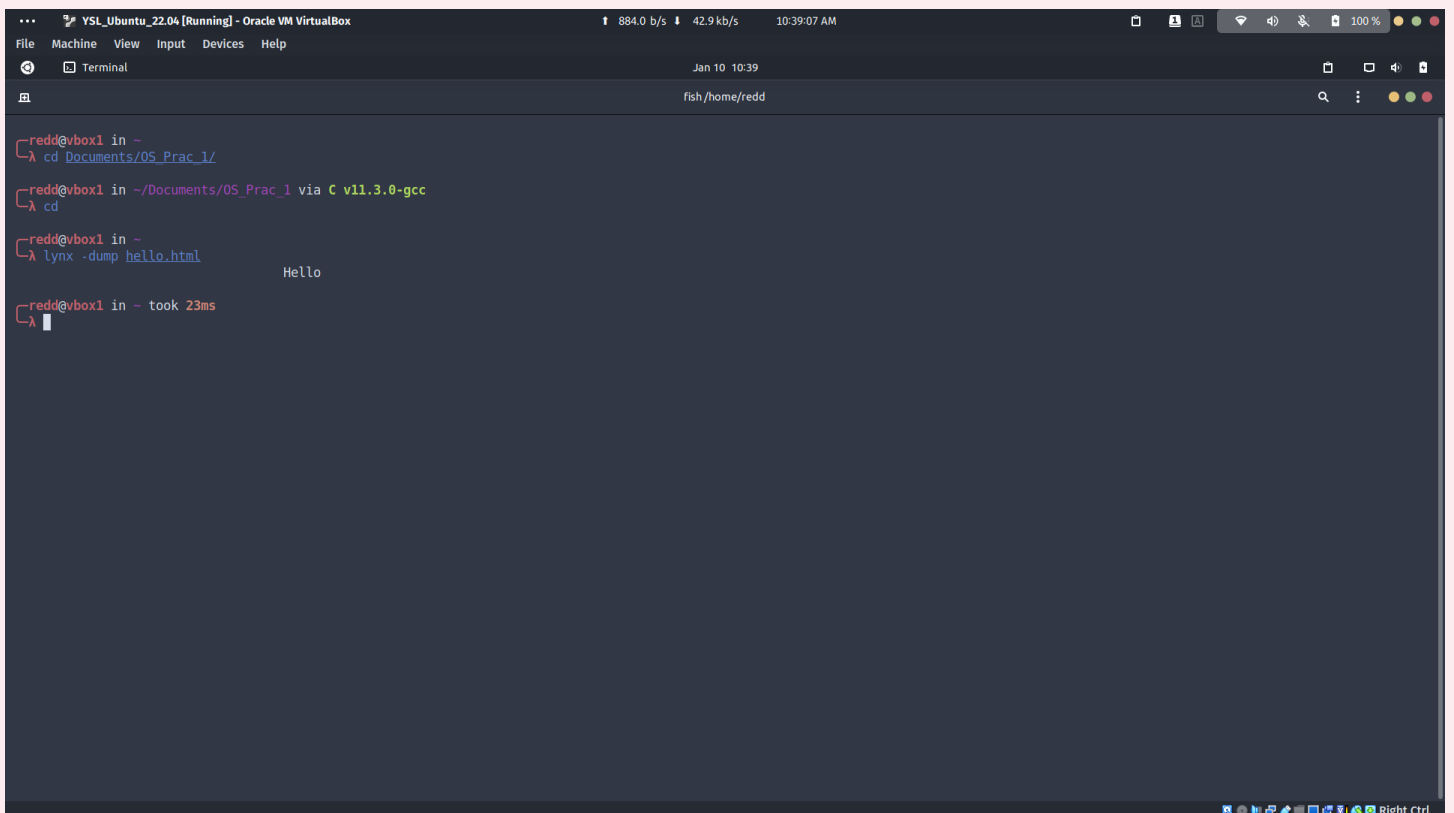


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**OS Practical 1**



The screenshot shows a terminal window titled "YSL\_Ubuntu\_22.04 [Running] - Oracle VM VirtualBox". The terminal is running the vim editor, editing a file named "hello.html" located at "/home/redd". The content of the file is as follows:

```
<html>
  <head></head>
  <body>
    <h1>Hello</h1>
  </body>
</html>
```



The screenshot shows a terminal window titled "YSL\_Ubuntu\_22.04 [Running] - Oracle VM VirtualBox". The terminal is running the fish shell, editing a file named "hello.html" located at "/home/redd". The user has navigated to the directory "/Documents/OS\_Prac\_1/" and compiled the file using "v11.3.0-gcc". The output of the compilation is "Hello".

```
redd@vbox1 in ~
λ cd Documents/OS_Prac_1/

redd@vbox1 in ~/Documents/OS_Prac_1 via C v11.3.0-gcc
λ cd

redd@vbox1 in ~
λ lynx -dump hello.html
Hello

redd@vbox1 in ~ took 23ms
λ
```