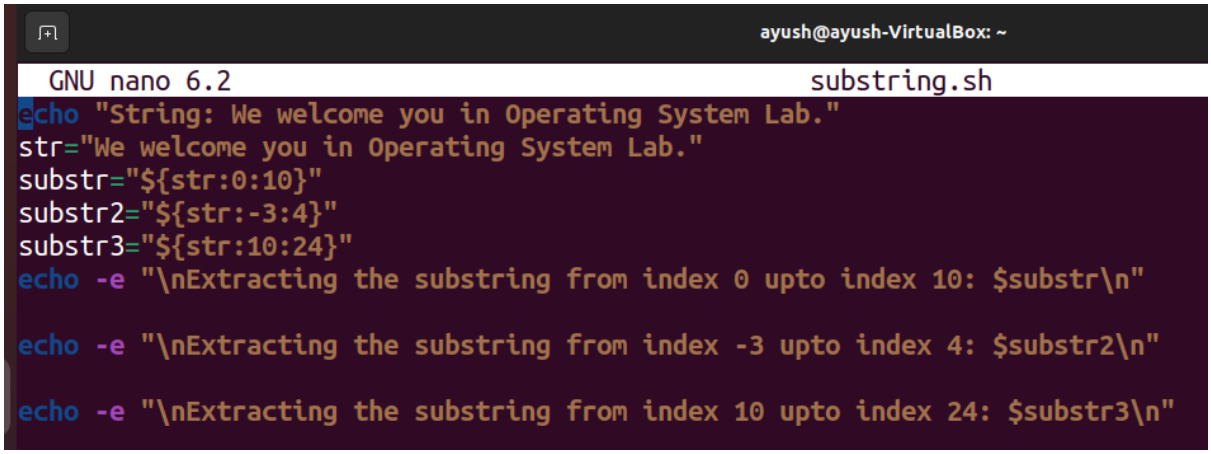
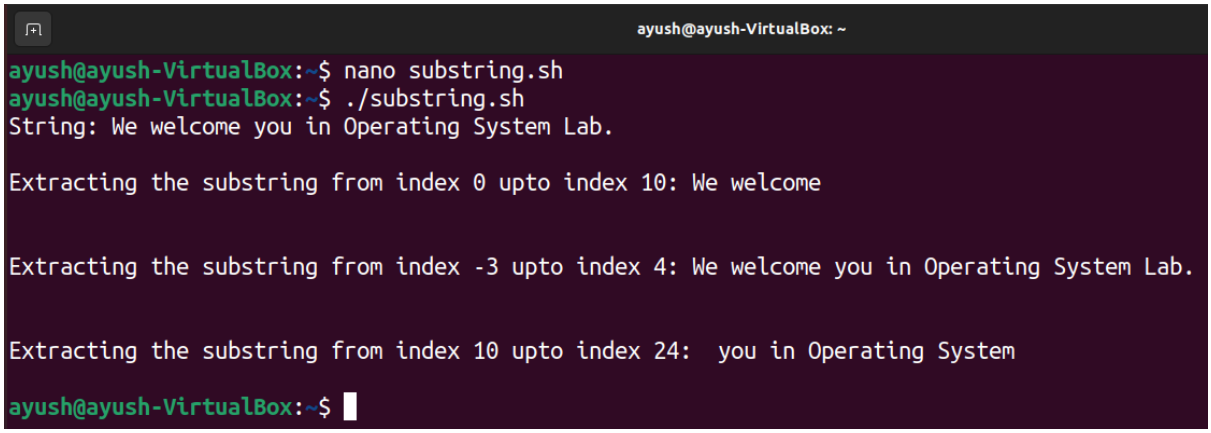
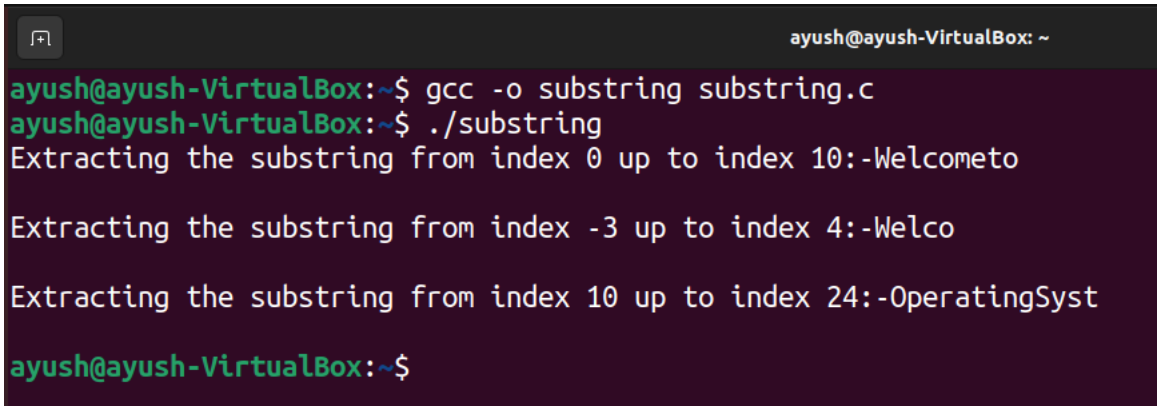
Write a shell script and C program to perform the following string operations:

a) To extract a substring from a given string.







```
 GNU nano 6.2                                                substring.c
#include <stdio.h>
int main()
{
        char str[50]="Welcome to Operating System Lab";

        // character extraction
        printf("Extracting the substring from index 0 up to index 10:-");
        {
        for (int i = 0; i<=10; i++) {
                if (str[i] != ' ') {

                        printf("%c", str[i]);
                }
        }
        }
        printf("\n\n");
        printf("Extracting the substring from index -3 up to index 4:-");
        {
        for (int i = -3; i<=4; i++) {
                if (str[i] != ' ') {
                        printf("%c", str[i]);
                }
        }
        }
        printf("\n\n");
         printf("Extracting the substring from index 10 up to index 24:-");
        {
        for (int i = 10; i<=24; i++){
                if (str[i] != ' ') {
                        printf("%c", str[i]);
                }
        }
        }
         printf("\n\n");
        return 0;
}
```

b) To find the length of a given string.

```
ayush@ayush-VirtualBox: ~
 GNU nano 6.2                                          string_lenght.sh
str="WELCOME to Operating System lab"
echo "The total no of char in the string are: ${#str}"
```

```
ayush@ayush-VirtualBox: ~
ayush@ayush-VirtualBox:~$ chmod +x string_length.sh
ayush@ayush-VirtualBox:~$ ./string_length.sh
The total no of char in the string are: 31
ayush@ayush-VirtualBox:~$
```

```
ayush@ayush-VirtualBox: ~
  GNU nano 6.2                                  string_length.c *
#include <stdio.h>
int main()
{
        char a[100]="Welcome to Operating System Lab";
        int length;
        length = strlen(a);
        printf("Length of the string = %d\n", length);
        return 0;
}
```

```
ayush@ayush-VirtualBox: ~
ayush@ayush-VirtualBox:~$ gcc -o string_length string_length.c
ayush@ayush-VirtualBox:~$ ./string_length
Length of the string = 31
ayush@ayush-VirtualBox:~$
```

Compare the running time of above shell script and C program using the time command.

```
ayush@ayush-VirtualBox: ~
ayush@ayush-VirtualBox:~$ time ./substring.sh
String: We welcome you in Operating System Lab.

Extracting the substring from index 0 upto index 10: We welcome


Extracting the substring from index -3 upto index 4: We welcome you in Operating System Lab.


Extracting the substring from index 10 upto index 24:  you in Operating System


real    0m0.010s
user    0m0.003s
sys     0m0.004s
ayush@ayush-VirtualBox:~$
```

```
ayush@ayush-VirtualBox: ~
ayush@ayush-VirtualBox:~$ time ./substring
Extracting the substring from index 0 up to index 10:-Welcometo

Extracting the substring from index -3 up to index 4:-Welco

Extracting the substring from index 10 up to index 24:-OperatingSyst


real    0m0.004s
user    0m0.002s
sys     0m0.001s
ayush@ayush-VirtualBox:~$
```